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IDENTIFIERS	Curriculum Mapping; South Western City Schools OH

ABSTRACT

This document contains materials developed for and about the construction technologies tech prep program of the South-Western City Schools in Ohio. Part 1 begins with a map of the program, which begins with a construction technologies program in grades 11 and 12 that leads to entry-level employment or one of five 2-year programs at a community college (architecture technology, civil engineering technology, construction management technology, heating and air conditioning technology, and landscape design/build) that in turn leads to a technical career or transfer to a four-year college or university. Also included in part 1 are pathways and pathway narratives for two high schools and a community college. Part 2, which constitutes approximately 40% of the document, lists the program's (unleveled) secondary technical and academic competencies. In part 3, the secondary competencies are leveled for a high school, and in part 4, the postsecondary competencies are leveled for a community college. Parts 5-7 contain the following: labor market data; list of advisory/review committee members; and program application (information on employment opportunities in the area, potential exit occupations for the program, and plans for the program's delivery). (MN)

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ED 414 455

HEART of OHIO TECH PREP CONSORTIUM

Construction Technologies

Approved, Consortium Board of Directors, 1996

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TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)

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- Secondary & Postsecondary Curriculum Pathways & Narratives
- Secondary Academic Competencies - Unleveled
- Secondary Competencies - Leveled per School
- Postsecondary Competencies
- Labor Market Data
- Advisory/Review Committee Members
- Program Application

CE075374

Heart of Ohio Tech Prep Consortium

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CONSTRUCTION TECHNOLOGIES
Heart of Ohio Tech Prep Consortium
Approved 1996, Consortium Board of Directors

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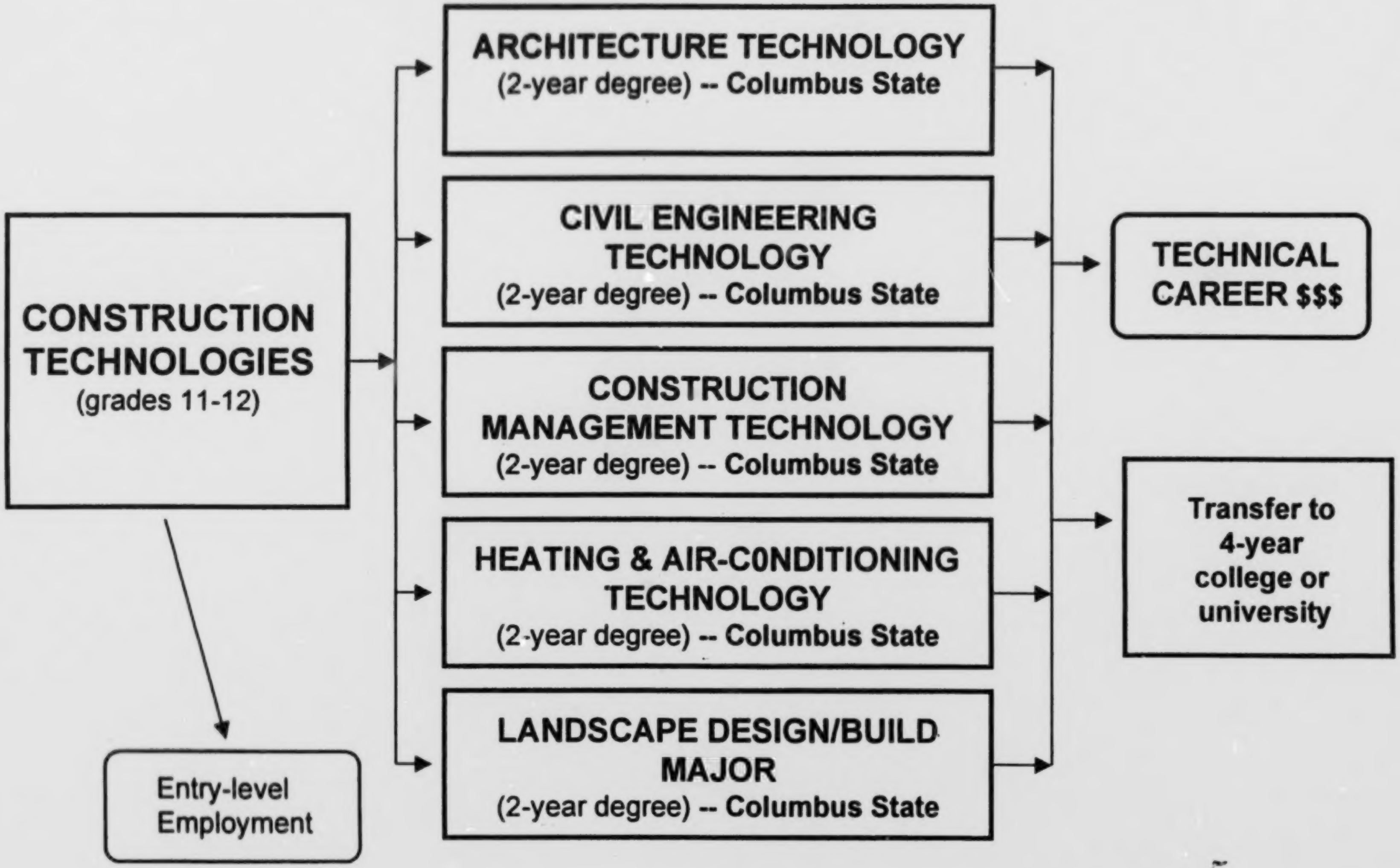
Heart of Ohio Tech Prep Consortium

MAP of CONSTRUCTION TECHNOLOGIES Tech Prep Program (12/97)



CONSTRUCTION TECHNOLOGIES
(grades 11-12)

ARCHITECTURE TECHNOLOGY
(2-year degree) -- **Columbus State**

CIVIL ENGINEERING TECHNOLOGY
(2-year degree) -- **Columbus State**

CONSTRUCTION MANAGEMENT TECHNOLOGY
(2-year degree) -- **Columbus State**

HEATING & AIR-CONDITIONING TECHNOLOGY
(2-year degree) -- **Columbus State**

LANDSCAPE DESIGN/BUILD MAJOR
(2-year degree) -- **Columbus State**

TECHNICAL CAREER $$$

Transfer to 4-year college or university

Entry-level Employment

HEART of OHIO TECH PREP CONSORTIUM
1996

Construction Technologies Model

PART I.A:
Secondary Curriculum Pathways and Narratives

Pickerington High School
Eastland Career Center-VEPD

Central Ohio Tech Prep Consortium

Construction Technology
July 1996

9th Grade	Min	10th Grade	Min	11th Grade	Min	12th Grade	Min
				College English 11 Tech Prep	40	College English 12 Tech Prep	40
				Algebra II Tech Prep	40	Advanced Mathmatics Tech Prep	40
				Elective	40	POD/Economics	40
				Tech Prep Lab with Integrated Science	150	* Tech Prep Lab	100-150

Prerequisites for Grade 11 Tech Prep:
Demonstrate potential for college preparatory course work as measured by standardized achievement test or by being enrolled in a college preparatory curriculum with no academic deficiencies for grades 9 and 10 & Algebra I.

Prerequisite for College Portion of Tech Prep:
Enrollment in 11th and 12th grade Tech Prep academic and course work or college preparatory work. Articulation or proficiency testing will determine where students are placed in the program.

Suggested Electives:
Foreign Languages (Grades 9 & 10)
Industrial Technology (Grades 9 & 10) (Areas of Consruction Technology & Engineering Drafting & Design)

Explanation of Tech Prep Blocks:
11th Grade: Tech Prep competencies taught in 150 minute lab. Flexible scheduling allows for applied and integrated math, communications and science during the tech lab period.
* 12th Grade: Occupational competencies developed through participation applied and integrated learning units; worksite-based internships, mentorships and/or post-secondary options.

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High School Exit Occupations:
Entry-Level CAD Drafter, Construction Laborer, Survey Crew Rod-person, Entry-Level Materials Technician, Construction Clerk, Entry-Level HAC Estimator, Entry-Level HAC Indoor Air Quality Technician

College Exit Occupations:	TECHNOLOGY				
	Architecture	Civil Engineering	Construction Management	Heating and Air Conditioning	Landscape
Exit Occupation/Position					
Construction Quality Control Technician		Yes	Yes		
Computer Aided Design/Drafter	Yes	Yes		Yes	Yes
Materials Technician	Yes	Yes	Yes		
Construction Field Engineer		Yes	Yes		
Assistant Construction Superintendent		Yes	Yes		
Assistant Construction Project Manager			Yes		
Surveying Technician/Construction Layout		Yes	Yes		
Construction Estimator		Yes	Yes		
Construction Scheduler			Yes		
Certified HVAC Service Technician				Yes	
HVAC Equipment/Ductwork Installation Technician				Yes	
Materials & Equipment Marketing and Sales			Yes	Yes	Yes
HVAC Control Specialist				Yes	

College Exit Occupations:	TECHNOLOGY				
	Architecture	Civil Engineering	Construction Management	Heating and Air Conditioning	Landscape
HVAC Equipment Application Technician			Yes		
Facilities Management Technician	Yes	Yes	Yes	Yes	Yes
HVAC Indoor Air Quality Technician				Yes	
Energy Management Technician				Yes	
Landscape Designer					Yes
Landscape Foreman					Yes
Wholesale/Retail Nursery Manager					Yes
Botanic Garden Manager					Yes
Arboriculture Crew Member					Yes
Irrigation Specialist					Yes
Estate Grounds Manager					Yes

Prerequisites for College Portion of Tech Prep:

No specific prerequisites are noted because articulation and/or proficiency testing will determine at what level the student will enter into the program. However, in order to follow the advanced-skills sequence as closely as possible, student should place into MATH 148 College Algebra. Students will be required to participate in college placement tests to determine mathematics and communication skill levels. Provision is made for students placing in higher level mathematics or communication skills.

Suggested Electives:

In addition to the Mathematics requirement, the student should have a unit of high school applied or technical physics. The specific area of physics should be in mechanics; i.e. vector analysis and resolution of forces. Occupation building electives should include exposure to carpentry or rough framing residential type structures (Heating and Air Conditioning Technology and Landscape Program excepted).

Advanced Skills Portion of Tech Prep:

The **shaded areas** of the attached curriculum represent those courses in the advanced skills portion. These courses add breadth and depth to the curriculum by enhancing the exit skills of the college graduate toward the occupations identified above.

Explanation of Tech Prep Course Differences:

The ~~struck-out areas~~ represent those courses which the competencies are offered at the high school level. Students wishing to obtain college credit for any of the ~~struck-out courses~~ can request a proficiency test. Student may attempt proficiency credit for any of the remaining courses listed in the curriculum.

CENTRAL OHIO TECH PREP CONSORTIUM
CURRICULUM PATHWAY NARRATIVE
Pickerington High School
Eastland - VEPD

Directions: Please complete this document to accompany the curriculum pathways.

In the space below, describe system change at the secondary level and what new options are now available for Tech Prep high school students (occupational, employability, and academic).

The students at Pickerington High School will benefit from an applied, integrated and team approach to make the Civil Engineering Technology curriculum relevant while delivering occupational competency to give the student employability and direction.

The primary focus of the Civil Engineering Technology program is to prepare students for continued study in two-year or four-year colleges after high school graduation. While meeting this goal, the program also prepares the student for an entry-level position in several civil engineering fields.

Approximately one-half of the day is spent in academic classes. Instructors in algebra and College English 11 will work closely with the program instructor to relate college-preparatory academic course work to the civil engineering career field. The math curriculum will apply math to the lab exercises while the English area will teach the student technical writing and communication skills. The students are expected to be involved in additional electives of their choice and interest.

The other half day involves textbook and hands-on learning connected to various aspects of civil engineering technology. The occupational competencies will be delivered in the 150 minute construction and CAD lab.

The science area of the Tech Lab will cover the analytical testing of construction materials, soil and water. The scheduling provides the flexibility for teachers to develop interdisciplinary units, team teach, and adjust periods allowing for more instructional time for specific topics.

The technical competencies will be delivered in the construction materials lab and Drafting/CAD lab to assure students will be proficient to enter the work force.

In addition to daily contact with the Civil Engineering instructor, students will receive input and instruction from other professionals in the field.

During the senior year of the program occupational competencies are developed through participation in school-based learning; worksite-based internships, mentorships, and/or enrollment in post-secondary options. Qualified seniors will spend the final six weeks involved in independent study and/or on-the-job training in an area of their chosen civil engineering technology profession.

Employability skills will be integrated with the 11th and 12th grade tech lab and communications class.

HEART of OHIO TECH PREP CONSORTIUM

1996

Construction Technologies Model

PART I.B:
Postsecondary Curriculum Pathways & Narratives

Columbus State Community College

Columbus State Community College **1996-1997** **Construction Technologies**

Pst secondary path
Construction Technologies Programs

Architecture Technology - Construction Focus

Heart of Ohio Tech Prep Consortium

June 28, 1996

1st Qtr.	Cr.	2nd Qtr.	Cr.	3rd Qtr.	Cr.	4th Qtr.	Cr.	5th Qtr.	Cr.	6th Qtr.	Cr.
ENGL 101 Beginning Composition	3	ENGL 102 Essay & Research	3	BMGT 111 Management	5	CIVL 232 Statics & Strength of Materials	3	HUM XXX Humanities	5	SSCI 1XX Social Science	5
MATH 104 Intermediate Algebra	5	MATH 118 College Algebra	5	COMM 1XX Speech or Conf & Group Disc.	3	ARCH 212 Mechanical Systems (HAC)	3	ENGL 204 Technical Writing	3	ARCH 216 Mechanical Systems (Plumbing)	3
ARCH 100 Intro. to Architecture	4	CPT 101 Computer Literacy I	3	ARCH 155 Structural Systems (Wood)	3	ARCH 232 Building Construction Standards	3	ARCH 214 Mechanical Systems (Electrical)	3	ARCH 264 Working Drawings II	5
~~ARCH 111 Basic Const. Drafting~~	~~3~~	ARCH 161 Architectural Drafting	4	LAND 152 Site Planning	4	ARCH 113 Construction CAD Drafting II	3	ARCH 263 Working Drawings I	4	Technical Elective	3
~~CIVL 120 Basic Const. Materials~~	~~3~~	~~CMGT 121 Building Construction Drawings~~	~~3~~	~~ARCH 112 Const. CAD Drafting~~	~~3~~	ARCH 250 Building Enclosure Materials	3	CIVL 237 Structural CAD Design & Detailing	4		
CMGT 131 Construction Quantity Survey	3	CMGT 106 Supervising Field Operations	3	CMGT 141 Building Estimating	2	ARCH 262 Presentations Drawings	4				
CMGT 115 Building Const. Methods	3										

Struck-out courses = those that students may articulate or pass via proficiency testing.
Shaded courses = advanced skills added to the curriculum.

Columbus State Community College **1996-1997** **Construction Technologies**

Post secondary path
Construction Technologies Programs

Architecture Technology- Landscape Major

Heart of Ohio Tech Prep Consortium

June 28, 1996

1st Qtr.	Cr.	2nd Qtr.	Cr.	3rd Qtr.	Cr.	4th Qtr.	Cr.	5th Qtr.	Cr.	6th Qtr.	Cr.
ENGL 101 Beginning Composition	3	ENGL 102 Essay & Research	3	ENGL 204 Technical Writing	3	LAND 205 Landscape Plants II	4	HUM XXX Humanities	5	SSCI 1XX Social Science	5
MATH 104 Intermediate Algebra	5	MATH 148 College Algebra	5	LAND 107 Landscape Maintenance	3	LAND 206 Landscape Graphics	4	COMM 105 Speech	3	LAND 207 Landscape Structures	3
LAND 101 Landscape Principles	4	CPT 101 Computer Literacy I	3	LAND 105 Landscape Plants I	4	LAND 152 Site Planning	4	LAND 202 Landscape Design II	4	LAND 110 Landscape Computer Appl.	3
~~ARCH 111 Basic Const. Drafting~~	4	BIO 125 General Botany	5	SURV 141 Basic Surveying	4	LAND 201 Landscape Pest Control	3	LAND 203 Landscape Water/Lighting Systems	3	LAND 108 Landscape Garden Flowers	3
~~CIVL 120 Basic Const. Materials~~	3	LAND 102 Landscape Design I	4					Technical Elective	3	LAND 222 Landscape Operations	3
CHEM 100 Introduction to Chemistry	4										
ARCH 113 Const. CAD Drafting II	3										

ARCH 291 Field Co-op Experience - Technical - 4 Credit Hours, Summer Quarter Between First and Second Year
Struck-out courses = those that students may articulate or pass via proficiency testing.
Shaded courses = advanced skills added to the curriculum.

Columbus State Community College
post secondary path
Construction Technologies Programs

1996-1997

Construction Technologies
Architecture Technology - Landscape Focus

Heart of Ohio Tech Prep Consortium

June 28, 1996

1st Qtr.	Cr.	2nd Qtr.	Cr.	3rd Qtr.	Cr.	4th Qtr.	Cr.	5th Qtr.	Cr.	6th Qtr.	Cr.
ENGL 101 Beginning Composition	3	ENGL 102 Essay & Research	3	BMGT 111 Management	5	CIVL 232 Statics & Strength of Materials	3	HUM XXX Humanities	5	SSCI 1XX Social Science	5
MATH 104 Intermediate Algebra	5	MATH 148 College Algebra	5	COMM 1XX Speech or Conf & Group Disc.	3	ARCH 212 Mechanical Systems (HAC)	3	ENGL 204 Technical Writing	3	ARCH 216 Mechanical Systems (Plumbing)	3
ARCH 100 Intro. to Architecture	4	LAND 102 Landscape Design I	3	ARCH 155 Structural Systems (Wood)	3	ARCH 232 Building Construction Standards	3	ARCH 214 Mechanical Systems (Electrical)	3	ARCH 264 Working Drawings II	5
~~ARCH 111 Basic Const. Drafting~~	3	ARCH 161 Architectural Drafting	4	LAND 152 Site Planning	4	LAND 202 Landscape Design II	3	ARCH 263 Working Drawings I	4	Technical Elective	3
~~CIVL 120 Basic Const. Materials~~	3	~~CMGT 121 Building Construction Drawings~~	3	~~ARCH 112 Const. CAD Drafting~~	3	ARCH 250 Building Enclosure Materials	3	CIVL 237 Structural CAD Design & Detailing	4		
LAND 101 Landscape Principles	3	ARCH 113 Construction CAD Drafting II	3	LAND 105 Landscape Plants I	4	ARCH 262 Presentations Drawings	4				
CPT 101 Computer Literacy I	3										

Struck-out courses = those that students may articulate or pass via proficiency testing.
Shaded courses = advanced skills added to the curriculum.

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Columbus State Community College **1996-1997** **Construction Technologies**

Post secondary path
Construction Technologies Programs

Architecture Technology - Surveying Focus

Heart of Ohio Tech Prep Consortium

June 28, 1996

1st Qtr.	Cr.	2nd Qtr.	Cr.	3rd Qtr.	Cr.	4th Qtr.	Cr.	5th Qtr.	Cr.	6th Qtr.	Cr.
ENGL 101 Beginning Composition	3	ENGL 102 Essay & Research	3	COMM 1XX Speech or Conf & Group Disc.	3	CIVL 232 Statics & Strength of Materials	3	HUM XXX Humanities	5	SSCI 1XX Social Science	5
MATH 104 Intermediate Algebra	5	MATH 148 College Algebra	5	LAND 152 Site Planning	4	ARCH 212 Mechanical Systems (HAC)	3	ENGL 204 Technical Writing	3	ARCH 216 Mechanical Systems (Plumbing)	3
ARCH 100 Intro. to Architecture	4	BMGT 111 Management	5	ARCH 155 Structural Systems (Wood)	3	ARCH 232 Building Construction Standards	3	ARCH 214 Mechanical Systems (Electrical)	3	ARCH 264 Working Drawings II	5
~~ARCH 111 Basic Const. Drafting~~	4	ARCH 161 Architectural Drafting	4	~~ARCH 112 Const. CAD Drafting~~	3	ARCH 250 Building Enclosure Materials	3	ARCH 263 Working Drawings I	4	Technical Elective	3
~~CIVL 120 Basic Const. Materials~~	3	~~CMGT 121 Building Construction Drawings~~	3	CMGT 123 Heavy Const. Drawings	3	ARCH 262 Presentations Drawings	4	CIVL 237 Structural CAD Design & Detailing	4	SURV 247 Townsite & Urban Development	3
CPT 101 Computer Literacy I	3			SURV 141 Basic Surveying	4	SURV 241 Route Surveying	4				
ARCH 113 Construction CAD Drafting II	3										

Struck-out courses = those that students may articulate or pass via proficiency testing.
Shaded courses = advanced skills added to the curriculum.

Columbus State Community College **1996-1997** **Construction Technologies**

Post secondary path
Civil Engineering Program

Civil Engineering Technology

Heart of Ohio Tech Prep Consortium

June 27, 1996

1st Qtr.	Cr.	2nd Qtr.	Cr.	3rd Qtr.	Cr.	4th Qtr.	Cr.	5th Qtr.	Cr.	6th Qtr.	Cr.
ENGL 101 Beginning Composition	3	ENGL 102 Essay & Research	3	CPT 101 Computer Literacy I	3	MCT 106 Computer Literacy II	3	SSCI XXX Social Science	5	HUM XXX Humanities	5
MATH 148 College Algebra	5	MATH 135 Elementary Statistics	5	Basic Science PHYS 117 GEOL 101 CHEM 113	5	CMGT 241 Planning & Scheduling	3	COMM XXX Speech or Conf & Group Disc.	3	SURV 247 Townsite & Urban Develop.	3
CMGT 123 Heavy Const. Drawings	3	CMGT 131 Const. Quantity Survey	3	SURV 141 Basic Surveying	4	SURV 241 Route Surveying	4	SURV 245 Survey Law	3	SURV 249 Land Subdiv. Systems	3
CIVL 121 Heavy Const. Materials	3	CMGT 125 Heavy Const. Methods	3	ENGL 204 Technical Writing	3	LAND 152 Site Planning	4	CIVL 232 Statics & Strength of Materials	3	SURV 243 Heavy Const. Standards	3
ARCH 113 Const. CAD Drafting II	3	CIVL 112 MicroStation CAD Drafting	3	CMGT 106 Supervising Field Operations	3	CIVL 221 Elementary Hydraulics	3	CIVL 223 Public Utility Systems	3	CMGT 248 Heavy Const. Estimating	2
~~CMGT 121 Building Const. Drawings~~	3	~~CMGT 105 Const. Contract Documents~~	3			REAL 102 Real Estate Law	3			Technical Elective	3
~~ARCH 111 Const. Basic Drafting~~	4	~~ARCH 112 Const. CAD Drafting~~	3			~~CMGT 113 Const Industry Survey (Tech. Elective)~~	3				
~~CIVL 120 Basic Const. Materials~~	3										

Struck-out courses = those that students may articulate or pass via proficiency testing.
Shaded courses = advanced skills added to the curriculum.

Columbus State Community College **1996-1997** **Construction Technologies**
Post secondary path **Construction Management Technology**
Construction Technologies Programs

Heart of Ohio Tech Prep Consortium

June 28, 1996

1st Qtr.	Cr.	2nd Qtr.	Cr.	3rd Qtr.	Cr.	4th Qtr.	Cr.	5th Qtr.	Cr.	6th Qtr.	Cr.
ENGL 101 Beginning Composition	3	ENGL 102 Essay & Research	3	MCT 106 Computer Literacy II	3	ENGL 200 Business Communications	3	HUM XXX Humanities	5	SSCI XXX Social Science	5
MATH 104 Intermediate Algebra	5	MATH 148 College Algebra	5	MATH 135 Elementary Statistics	5	CMGT 248 Heavy Const. Estimating	2	COMM XXX Speech or Conf & Group Disc.	3	CMGT 261 Construction Project Management	3
CMGT 115 Building Const. Methods	3	CPT 101 Computer Literacy I	3	CMGT 135 Safety & Loss Prevention	3	CMGT 241 Planning & Scheduling	3	CMGT 251 Construction Cost Controls	3	CMGT 263 Marketing Constuction Services	3
CMGT 123 Heavy Const. Drawings	3	CMGT 106 Supervising Field Operations	3	CMGT 141 Building Estimating	2	CMGT 243 Construction Labor Law	3	CMGT 252 Construction Contract Law	3	SURV 241 Route Surveying	4
CMGT 125 Heavy Const. Methods	3	CMGT 131 Const. Quantity Survey	3	CIVL 121 Heavy Const. Materials	3	SURV 141 Basic Surveying	4	CMGT 231 Computer Estimating	3	Technical Elective	3
~~CMGT 105 Const. Contract Documents~~	3			~~CIVL 120 Basic Const. Materials~~	3	CMGT 253 Residential Construction	3	Technical Elective	3		
~~CMGT 121 Building Construction Drawings~~	3										

Struck-out courses = those that students may articulate or pass via proficiency testing.
Shaded courses = advanced skills added to the curriculum.

Columbus State Community College
Post secondary path
Construction Technologies Program

1996-1997

Construction Technologies
Heating and Air Conditioning Technology

Heart of Ohio Tech Prep Consortium

June 27, 1996

1st Qtr.	Cr.	2nd Qtr.	Cr.	3rd Qtr.	Cr.	4th Qtr.	Cr.	5th Qtr.	Cr.	6th Qtr.	Cr.
ENGL 101 Beginning Composition	3	ENGL 102 Essay & Research	3	ENGL 200 Business Communications	3	EET 101 Basic Electricity	3	SSCI XXX Social Science	5	HUM XXX Humanities	5
CPT 101 Computer Literacy I	3	MATH 104 Intermediate Algebra	5	MATH 148 College Algebra	5	COMM 105 Speech	3	EET 102 Electronics & Digital Fundamentals	3	HAC 243 Air Conditioning Systems	4
HAC 141 Principles of Refrigeration	3	HAC 112 HAC Piping Systems	4	HAC 152 Instrumentation/ Combustion	4	HAC 253 Automatic Controls	3	HAC 244 Heat Pump Systems	4	HAC 266 Advanced Problems	4
HAC 183 Wiring Diagrams I	4	HAC 161 Hand Tools Laboratory	4	~~ARCH 112~~ ~~Const. CAD Drafting~~	~~3~~	HAC 231 Commercial Load Calculations	4	HAC 256 Automatic Controls II	3	HAC 2XX Technical Elective	3
~~ARCH 111~~ ~~Const. Basic Drafting~~	4	HAC 284 HAC Wiring Diagrams II	4	HAC 222 Residential Load Calculations	3	HAC 254 Heating Systems	4	HAC 242 Mechanical Standards/ Safety	3	~~CIVL 120~~ ~~Basic Construction Materials~~	~~3~~
ARCH 113 Const. CAD Drafting II	3			HAC 287 Boiler Systems	3					HAC 235 Field COOP	4

Struck-out courses = those that students may articulate or pass via proficiency testing.
Shaded courses = advanced skills added to the curriculum.

High School Exit Occupations:
Entry-Level CAD Drafter, Construction Laborer, Survey Crew Rod-person, Entry-Level Materials Technician, Construction Clerk, Entry-Level HAC Estimator, Entry-Level HAC IAQ Technician

College Exit Occupations:	**TECHNOLOGY**				
	Architecture	**Civil Engineering**	**Construction Management**	**Heating and Air Conditioning**	**Landscape**
Exit Occupation/Position					
Construction Quality Control Technician		Yes	Yes		
Computer Aided Design/Drafter	Yes	Yes		Yes	Yes
Materials Technician	Yes	Yes	Yes		
Construction Field Engineer		Yes	Yes		
Assistant Construction Superintendent		Yes	Yes		
Assistant Construction Project Manager			Yes		
Surveying Technician/Construction Layout		Yes	Yes		
Construction Estimator		Yes	Yes		
Construction Scheduler			Yes		
Certified HVAC Service Technician				Yes	
HVAC Equipment/Ductwork Installation Technician				Yes	
Materials & Equipment Marketing and Sales			Yes	Yes	Yes
HVAC Control Specialist				Yes	

HVAC Equipment Application Technician			Yes		
Facilities Management Technician	Yes	Yes	Yes	Yes	Yes
HVAC IAQ Technician				Yes	
Energy Management Technician				Yes	
Landscape Designer					Yes
Landscape Foreman					Yes
Wholesale/Retail Nursery Manager					Yes
Botanic Garden Manager					Yes
Arboriculture Crew Member					Yes
Irrigation Specialist					Yes
Estate Grounds Manager					Yes

Curriculum Pathway Narrative

Columbus State Community College, Construction Technologies
July 29, 1996

In the space below, briefly describe the systemic change at the postsecondary level and what new options will be available for Tech-Prep college students (occupational, employability, and academic).

Systemic change that will occur in the Construction Technologies at Columbus State Community College as a result of implementing the Tech Prep pathways described in this document include the following:

- Advanced skills competencies will offer greater technical breadth and depth at the post-secondary level. Addition of these components will be made possible as secondary Tech Prep students who enroll in the college pathways arrive with improved academic readiness as well as foundational technical and employability skills. The addition of the advanced skills components will help ensure that the industry's expectations are met for qualified technical personnel with preparation in the following industry-specified competency cluster areas:

  Communications
  Personal Development
  Mathematics
  Science
  Social and Cultural Literacy
  Technological Literacy
  Engineering Technology Applications

- Industry is asking colleges to provide graduates who are broadly educated across disciplines as well as specifically prepared in technology specialties. The Heart of Ohio Tech Prep Consortium's approach addresses these seemingly incompatible needs on a program-by program basis, ensuring that students develop both the necessary context as well as the specific work skills required for success in the industry of their choice. This approach optimizes graduates' ability to be immediately productive and job-ready upon college graduation. It also assists private businesses in maintaining their competitive ability and public entities to be more efficient and user-responsive during this period of rapid technological change.

  The Consortium will continue to validate and update the Construction Technologies program and pathways on a periodic basis through a variety of assessment methods carried out by its partners:

  Advisory Committee input (school-level, college-level, and Consortium-level)

Industry validation surveys
DACUMs
Focus groups
Input of college adjunct faculty who are active in the industry
Upper-level transfer agreements

The Construction Technologies Tech Prep program will be structured to meet industry needs so that changing foundational competencies are placed into clusters at the secondary level, and emerging and advanced skills are clustered in the college pathways. Graduates of the secondary Tech Prep pathways have the advantage of being better prepared to start on schedule and to start deeper (both technically and, in some cases, academically) in their selected program of study. Graduates of any of the college Tech Prep pathways in Construction Technologies will gain additional skills beyond those offered in the traditional college program, and are expected to be more attractive to employers as job applicants and productive technicians in the construction industry.

HEART of OHIO TECH PREP CONSORTIUM

1996

Construction Technologies Model

PART II.A:
Secondary Technical Competencies (Unleveled)

(Also, Lab floor plan and equipment list)

CONSTRUCTION BASIC DRAFTING (Columbus State course, ARCH 111)

111.1.1 Correctly setup and use manual drafting tools to produce a quality drawing.

111.1.1.1 Clean, maintain and adjust the parallel bar or drafting machine.

111.1.1.2 Lay down and align a sheet of drafting vellum on the work surface ready for drafting.

111.1.1.3 Use a sand pad for sharpening lead compass points and/or a pencil pointer for sharpening lead holder points.

111.1.1.4 List the various hardness of graphite leads and corresponding numbers.

111.1.1.5 Use the Ames Lettering Guide to produce guidelines for consistent free-hand letter heights.

111.1.1.6 Maintain and use the compass to produce circular curves and ellipses.

111.1.1.7 Maintain lead holders and utilize the proper rotational method to maintain a conical point when drawing lines.

111.1.1.8 Identify the units on an Architect's scale and use the scale to lay out dimensions on a drawing.

111.1.1.9 Identify the units on an Engineer's scale and use the scale to lay out dimensions on a drawing.

111.1.2 Develop basic sheet elements and draw simple geometric constructions.

111.1.2.1 Pre-plan a sheet for optimum placement of drawings and for space usage on the sheet.

111.1.2.2 Develop borders and title blocks.

111.1.2.3 Draw lines at 15° increments radiating from a central point using a combination the 45° and the 30° - 60° triangles.

111.1.2.4 Use circle templates, and irregular or adjustable curves to produce arcs, spirals and irregular lines.

111.1.2.5 Construct geometric shapes including, circles, polygons and non-regular shapes.

111.1.3 Develop a consistent free-hand (letter height, spacing and legibility) lettering style.

111.1.3.1 Apply the appropriate lettering sizes to dimensions, notes, sub-titles and titles.

111.1.4 Use the current industry standard method of dimensioning and referencing drawings.

111.1.4.1 Use datum elevation bullets for height notations on elevations and sections.

111.1.4.2 Apply the correct scale to various types of drawings; i.e., site plans, floor plans, elevations and section cuts.

111.1.4.3 Use various line weights (widths) and order of importance to differentiate between the object and other elements such as centerlines, dimensions, hidden features and property lines.

111.1.4.4 Use various line weights (widths) to convey the illusion of depth, distance or separation.

111.1.4.5 Use common architectural dimensioning system including continuous dimension strings.

111.1.5 Explain and illustrate the relationships of views in orthographic projection.

111.1.5.1 Develop two dimensional (orthographic views) from three dimensional object, including straight, curved surfaces, and oblique surfaces.

111.1.5.2 Generate auxiliary views of oblique surfaces to develop true size and shapes of planes.

111.1.5.3 Reproduce a simple floor plan at an appropriate scale using proper line weights to identify full height and lesser walls, built-in items, and fixtures.

111.1.5.4 Use the appropriate symbols, linework and poche to indicate walls, doors, windows, hidden overhead elements, and materials of construction.

111.1.5.5 Develop exterior building elevations from floor plans and section cuts.

111.1.5.6 Use simple material symbols to indicate exterior materials of construction.

111.1.5.7 Use a simple building section (outline) to develop exterior elevations.

111.1.6 Use the appropriate scale, measurement systems and symbols to develop site plans including cadastral (legal property information) and site plan information and topographic (physical objects) information.

111.1.7 Use electrical symbols and HVAC symbols to develop electrical and mechanical drawings.

111.1.8 Make simple blueline diazzo print copies of original manuscripts.

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CONSTRUCTION CAD DRAFTING (Columbus State course, ARCH 112)

112.2.1 Describe the inter-relationship of computer hardware and software comprising a CAD Drafting system.

112.2.1.1 List and describe the hardware components necessary to support CAD Drafting system.

112.2.1.2 Describe the inter-relationship of the software comprising the CAD Drafting system and differentiate between the operating system and the applications software.

112.2.1.3 Use the operating system to format storage devices (diskettes) to save files and to enter and exit the CAD application program; be familiar with the file utility commands for creating a new drawing, opening an existing file and ending a drawing session.

112.2.1.4 Identify the various components depicted on the graphics screen, i.e. pull down mens, icons, and dialogue boxes; use the mouse (puck) to pick, enter (accept), and cancel from the screen or tablet.

112.2.1.5 Compare and contrast the organization, elements (font size, dimensioning practices and sheet organization) and drawing setup procedures for manual drafting and CAD drafting

112.2.1.6 Use the function keys to control graphic screen actions.

112.2.2 Describe the function of and use the drawing commands to set up and create a drawing.

112.2.2.1 Describe and use the drawing units commands involving unit settings, layers, scaling and line types to create a proto-type drawing.

112.2.2.2 Describe and use the drawing commands involving lines polylines, circles arcs, ellipses and regular polygon shapes to create borders on a proto-type drawing.

112.2.2.3 Describe standard drawing for formats and use the layering system to produce multiple drawings from a common "seed" file.

112.2.3 Describe the function of and use editing commands to modify and accelerate the drawing process.

112.2.3.1 Describe and use the editing commands to zoom, pan, oops, redraw/regenerate undo, erase, redo and set the view resolution to create and edit drawings.

112.2.3.2 Describe and use the editing commands to offset, trim and extend lines and to create fillets at the intersection of lines.

112.2.3.3 Describe and use the editing commands involving moving, copying, scaling, rotating, breaking and stretching to modify the drawing; use the array and mirroring command to accelerate the drawing process. Produce an architectural floor plan and two elevations of a small office building.

112.2.3.4 Describe and use the editing commands involving dividing, exploding and measuring lines.

112.2.4 Describe and use the object snaps, selection settings and precision inputs to control the drawing process.

112.2.5 Describe and use the inquiry commands to check the drawing.

112.2.6 Describe and use the text commands to create text styles, set text size, annotate and correctly place text in the drawing.

112.2.7 Describe and use dimensioning command to establish dimension accuracy, settings and positioning of dimensions on the architectural floor plan of a small office building.

112.2.8 Describe the function of and use of block command to create a library of commonly used elements.

112.2.8.1 Describe and use the block commands to create an architectural library of elements in building construction; i.e., windows, doors, plumbing fixtures and furniture. Correctly place the blocks in the architectural floor plan of a small office building.

112.2.8.2 Create a site plan using surveying units. Use the block commands to create library of site elements. Using the floor plan, create and insert the roof plan of the small office building as a block into the site plan.

112.2.9 Use the file command to create, store and export data exchange (DXF) files into and out of AutoCAD.

112.2.10 Use the plot command to plot the site drawing and architectural plan/elevation sheet.

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BASIC CONSTRUCTION MATERIALS

(Columbus State course, CIVL 120 ; formerly ARCH 120)

120.3.1 Perform basic area, volumetric, strength and density calculations.

120.3.1.1 Perform mass, volume, specific weight and specific gravity calculations.

120.3.1.2 Perform force, area, stress and strength calculations.

120.3.2 Use industry standard references and specifications to determine material acceptability.

120.3.2.1 Describe quality control and quality assurance in by conformance to industry codes, specifications, standards and formats.

120.3.2.2 Differentiate amongst industry codes, specifications, standards and formats and cite applicable examples.

120.3.2.3 Compare industry manufacturer's data to standard references and specifications to determine material acceptability.

120.3.3 Perform basic soils analyses.

120.3.3.1 Describe soil particles by grain size in accordance with American Association of State Highway Transportation Officials (AASHTO) standards.

120.3.3.2 Determine the moisture content of a soil sample in accordance with American Society of Testing Materials , ASTM D-2216 or ASTM D-4643.

120.3.3.3 Determine Soil Particle Size by Sieve Analysis in accordance with ASTM D-442.

120.3.3.4 Describe the procedure for performing soil compaction test by Proctor Method in accordance with ASTM D-698 and ASTM D-1557.

120.3.3.5 Differentiate between the procedures for Standard and Modified Proctor Tests.

120.3.4 Describe the manufacture and list the basic test applicable to bituminous (flexible) pavement.

120.3.4.1 Describe the process in the manufacture and placement of bituminous (flexible) pavement.

120.3.4.2 List the tests and inspection procedures in the manufacture and placement of bituminous (flexible) pavement.

120.3.4.3 Describe the structure (base, intermediate and wearing coarses) of various types of bituminous (flexible) pavement systems including applications.

120.3.5 Perform basic Portland Cement Concrete tests.

120.3.5.1 Properly prepare, weigh and mix the ingredients for Portland Cement Concrete.

120.3.5.2 Describe the proper procedure for sampling freshly-mixed concrete in accordance with ASTM C-172.

120.3.5.3 Obtain temperature of freshly-mixed Portland Cement Concrete in accordance with ASTM C-1064.

120.3.5.4 Perform the Slump Test of Portland Cement Concrete in accordance with ASTM C-143.

120.3.5.5 Describe the proper procedure for determining the Air Content of freshly-mixed Portland Cement Concrete by Pressure Method in accordance with ASTM C-231.

120.3.5.6 Perform the correct procedure for Casting and Curing Portland Cement Concrete Test Specimens in the Field in accordance with ASTM C-31.

120.3.5.7 Perform the correct procedure for determining the Compressive Strength of Cylindrical Concrete Specimens in accordance with ASTM C-39.

120.3.5.8 List three (3) methods including corresponding ASTM specification number of testing the strength of "in place" concrete.

120.3.6 Describe the manufacture, perform basic testing and build simple structures of masonry products

120.3.6.1 Describe the major operations in the manufacture of brick.

120.3.6.2 Describe the major operations in the manufacture of concrete masonry units (CMU's)

120.3.6.3 Properly prepare, weigh and mix the ingredients for Portland Cement Mortar in accordance with ASTM C-150.

120.3.6.4 Construct a small masonry wall.

120.3.6.5 Describe the correct procedure for testing Concrete Masonry Units in accordance with ASTM C-140 for conformance with ASTM C-90.

120.3.6.6 Describe the correct procedure for Sampling and Testing Brick and Structural Clay Tile in accordance with ASTM C-67 and ASTM C-216.

120.3.7 List the materials, describe the properties, applications and testing of metals in Division 0500 for the Construction Specification Institute format.

120.3.7.1 List the metals, each metal's application and resistance to corrosion..

120.3.7.2 Describe the typical metals test for strength.

120.3.7.3 Identify the critical points, corresponding stress and strain and the ranges on a stress/strain curve.

120.3.7.4 Given the characteristic shapes of specific stress/strain curves; identify the specific metal.

120.3.7.5 Given American Institute of Steel Construction (AISC) standards designations for rolled sections, identify the specific shape, by picture/graphic, and where applicable list the section's name and weight per lineal foot.

120.3.7.6 List the major methods of joining steel sections.

120.3.7.7 By ASTM designation, list the various alloys of structural steel and corresponding properties.

120.3.7.8 Differentiate between the chemical composition and associated properties of cast iron and steel.

120.3.7.9 Compare and contrast the methods and benefits of steel (metal studs) framing and wood framing.

120.3.8 List the general classifications and grades and applications, describe defects, perform basic strength tests and construct a simple structure of wood products.

120.3.8.1 Differentiate between softwoods and hardwoods.

120.3.8.2 Describe the possible defects in wood.

120.3.8.3 In accordance with U.S. Department of Commerce Product Standard PS 20 list the various grade of softwoods and give specific examples.

120.3.8.4 Rough frame a wall having at least one (1) opening or penetration.

120.3.8.5 List the various types of manufactured wood (i.e. plywood, oriented strand board, etc.) in accordance with American Plywood Association (APA) Standards and cite examples.

120.3.8.6 In accordance with American Plywood Association (APA) Standards, describe the grades and ratings applicable to manufactured wood systems.

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CONSTRUCTION CONTRACT DOCUMENTS (Columbus State course, CMGT 105)

105.7.1 Explain the necessity and develop the ability to clearly communicate via spoken and written word.

105.7.1.1 Prepare verbal and written communications such as requests for information (RFI's), addenda and change orders. Discuss the importance of documenting all project communications.

105.7.1.2 Explain the benefits of resolving contractual differences through partnering versus litigation.

105.7.2 List, describe and correlate amongst the various documents used in the construction industry.

105.7.2.1 Compare the similarities and contrast the differences amongst various types of specification manuals.

105.7.2.2 List the various types of forms and documents which comprise a complete set of contract documents.

105.7.2.3 Correlate between specific documents and the phase in the construction sequence in which each is used.

105.7.3 List and discuss construction bidding procedures and related documents.

105.7.3.1 Compare the similarities and contrast the differences amongst the selection process for design professionals, construction managers and design-builder.

105.7.3.2 Compare the similarities and contrast the differences amongst design professional agreements, construction management agreements and design-build agreements.

105.7.3.3 Examine and differentiate the pros and cons of competitive-bid versus negotiated bid packages.

105.7.3.4 Describe and identify the main points of the Ohio Bidding Law of 1988 as pertains to public works projects.

105.7.3.5 Compare the similarities and contrast the differences between public advertisements and invitations to bid.

105.7.4 List the types, describe the function and outline the differences of the various bid submittal documents.

105.7.4.1 List the significant information that must be included in a lump sum and in a unit price proposal form.

105.7.4.2 Identify and list the significant information pertinent to bid bonds that is required of a general contractor and a sub-contractor.

105.7.4.3 Examine and summarize quotation requests received by general contractors from sub-contractors.

105.7.5 List the types, describe the function and outline the differences of the various types of agreements.

105.7.5.1 List the four (4) conditions which must be fulfilled to constitute a valid contract.

105.7.5.2 Compare the similarities and contrast the differences amongst the standard contract forms used in the construction industry.

105.7.5.3 Based on the strengths and weaknesses of each, determine under which set of conditions when a lump sum, unit price or cost-plus fixed fee contract is most effectively used by the owner and the contractor.

105.7.6 Describe the major points of performance bonds and payment bonds.

105.7.6.1 List the necessary qualifications a contractor needs to secure bonding.

105.7.7 List the methods and discuss the use and applications of performance tracking devices used as supporting documents to the construction agreement.

105.7.7.1 Describe the use of bar charts, critical path method (CPM), and precedence diagramming method (PDM) in predicting and tracking progress on construction progress.

105.7.7.2 Correlate the effectiveness of bar charts, CPM's and PDM's to specific types of projects.

105.7.8 Describe the contractual relationship of the owner, contractor, subcontractors and design professionals.

105.7.9 List and describe the major points of the General Conditions of a set of Contract Documents.

105.7.9.1 Describe the relationship of the Supplemental Conditions to the General Conditions of a set of Contract Documents.

105.7.9.2 Identify important government provisions in Governmental Supplemental Conditions.

105.7.10 Discuss the inter-relationship of drawings and specifications and outline specification organization

105.7.10.1 Compare the relationship of the drawings to the specifications.

105.7.10.2 Explain the important parts (components) of specification formatting.

105.7.10.3 Summarize the importance of using standardized specification language and how it best benefits the construction team.

105.7.10.4 Correlate the seventeen (17) Construction Specification Institute (CSI) headings (including Division 0) with trade organizations in the construction industry.

105.7.10.5 Examine a specification manual and respond correctly to a set of questions within a prescribed timetable as required in a real job setting.

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CONSTRUCTION INDUSTRY SURVEY (Columbus State course, CMGT 112)

101.0.1 Describe the various construction industry phases, disciplines and their inter-relationships.

101.0.1.1 List the various disciplines working in the construction industry and produce a diagram illustrating their inter-relationships.

101.0.1.2 List the traditional phases of the construction process; i.e., planning, design, construction and operations.

101.0.1.3 Describe various ways in which design professionals obtain projects. Compare and contrast the means by which design professionals obtain projects and contractors obtain projects.

101.0.2 Differentiate between private development and public works projects by funding sources and general length of project.

101.0.2.1 List three (3) major types of private development; give one example of each.

101.0.2.2 List two (2) major types of public works projects; i.e., building and heavy construction. Give three (3) examples of each.

101.0.3 Identify four (4) major challenges (potential problems) in each phase of the construction industry; cite a local or regional example of each.

101.0.4 List and differentiate amongst the various trades and professional organizations in the construction industry.

101.0.4.1 Differentiate between union and open shop contractors.

101.0.4.2 List the services provided by a union.

101.0.4.3 List three (3) contractor organizations and two (2) services provided by each.

101.0.5 Substantiate the need for life-long learning (continuing education). List six (6) methods of life-long learning.

101.0.5.1 List at least one professional organization for each of the professions engaged in the construction industry; i.e., architecture, civil engineering, landscape architecture, construction management and surveying.

101.0.5.2 List one serial publication for each of the professions engaged in the construction industry; i.e., architecture, civil engineering, landscape architecture, construction management and surveying.

101.0.5.3 Perform a local job market survey of five (5) technical level jobs within the construction industry and salary ranges associated with each type of job.

101.0.6 Discuss the need for professional registration and technical certification; differentiate between professional registration and technical certification.

101.0.6.1 List the disciplines within the construction industry which require professional (State of Ohio) registration and list the requirements to attain professional registration in each discipline.

101.0.6.2 List three (3) examples of industry or local certifications required of technicians working in Central Ohio.

101.0.7 Visit and complete a field trip report on a company or local governmental agency engaged in the construction industry.

101.0.7.1 Develop an employment description for a technician's position in civil engineering including responsibilities and compensation.

101.0.8 Identify three (3) types of project management and list one of the strengths and weaknesses of each.

101.0.9 Identify three (3) non-traditional types of workers entering the construction industry and list one (1) of their special needs or entry barriers into the industry.

101.0.10 Identify five (5) regulatory agencies exercising authority in the construction industry.

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BUILDING CONSTRUCTION DRAWINGS

(Columbus State course, CMGT 121; formerly ARCH 121)

121.6.1 Define the purpose, components and organization of construction documents.

121.6.1.1 List the two (2) major components of construction documents; i.e., drawings and specifications.

121.6.1.2 List the eleven (11) general sections of the specifications.

121.6.1.3 List by number and corresponding name the seventeen (17) divisions (including Division 0) within the body of the specifications as defined by Construction Specification Institute (CSI) format.

121.6.1.4 Explain the purpose of an Addenda.

121.6.1.5 Explain the purpose of a Change Order.

121.6.1.6 List the general organization of the drawings.

121.6.1.7 Correlate the major elements comprising the drawings (i.e.; architectural, mechanical, plumbing and electrical) and the various disciplines in the construction industry.

121.6.1.8 Identify the various materials used in the drawings by symbol and corresponding name.

121.6.2 Obtain dimensions from the drawings and perform area and volume calculations.

121.6.2.1 Identify the units on an engineer's scale.

121.6.2.2 Use the engineer's scale to determine dimensions on the drawings.

121.6.2.3 Identify the units on an architect's scale.

121.6.2.4 Use the architect's scale to determine dimensions on the drawings.

121.6.2.5 Perform linear, area and volume calculations.

121.6.3 Correlate (Cross-Reference) between items found on the drawings, listed in the specifications and described in manufacturer's data (Sweets Catalogues).

121.6.4 List the major information items found on the Site Plan.

121.6.4.1 Given the site plan for a commercial building, locate and list the legal (property boundary) information and the topographic (natural and man-made physical) information.

121.6.5 List the major information items found on the Foundation Drawings.

121.6.5.1 Given the foundation plan for a commercial building, classify the type of foundation and list the major components comprising the foundation system including materials..

121.6.5.2 Correlate the soils information to the site plan and foundation plan.

121.6.6 Relate floor plans, exterior elevations, partial elevations and wall sections.

121.6.6.1 List the major information items found on the floor plans.

121.6.6.2 Given the floor plan for a commercial building, prepare a list of room names and numbers, interior dimensions, materials of construction and size and types of wall penetrations.

121.6.6.3 List the major information items found on the exterior elevations.

121.6.6.4 Given the drawings for a commercial building, prepare a list of the exterior materials, size and types of exterior wall penetrations and vertical dimensions to key building elements.

121.6.6.5 List the major information items found on the wall sections.

121.6.6.6 Explain the drawing reference system used to relate floor plans to wall sections.

121.6.6.7 Given the drawings for a commercial building, cite three (3) examples of the way floor plan cuts relate to wall sections.

121.6.6.8 Given the wall sections for a commercial building, list the materials of construction and corresponding wall thicknesses.

121.6.6.9 Explain the relationship of interior elevations and room finish, door and window schedules and reflected ceiling plans.

121.6.7 Locate and list the major information items found on the structural drawings.

121.6.7.1 Given the structural drawings for a commercial building, prepare a list of the major structural shapes, materials of construction and corresponding names.

121.6.8 List the major information items found on the Mechanical (HVAC) Drawings.

121.6.9 List the major information items found on the Plumbing Drawings.

121.6.9.1 Given the Plumbing Drawings for a commercial building, identify plumbing symbols by symbol and corresponding name.

121.6.9.2 Explain the basic differences between Plumbing Drawings (schematic & isometric)) and architectural drawings (true planimetric).

121.6.10 List the major information items found on the Electrical Drawings.

121.6.10.1 Given the Electrical Drawings for a commercial building, identify electrical symbols by symbol and corresponding name.

121.6.10.2 Explain the basic differences between electrical drawings (schematic) and architectural drawings (true planimetric).

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CIVL 120 BASIC CONSTRUCTION MATERIALS
LABORATORY EQUIPMENT REQUIREMENTS
Based On Current Laboratory Numbering System*

Equipment Name	Forney Reference Number	Type of Testing	CIVL 120 Laboratory Project Number
Triple Beam Balance	LA-0470	Soil Moisture	Labs 1, 4 & 5
Balance Weight Set	LA-0475	Soil Moisture	Labs 1, 4 & 5
Soil Sample Tins (Containers)	LA-2583	Soil Moisture	Labs 1, 4 & 5
Sample Drying Oven	LA-0886-70	Moisture Content	Labs 1,2,3,4,5 & 8
Double Beam Balance	Ohaus 20 Kg.	Aggregates	Lab 3
1.5 " U.S. Standard Sieve	LA-0563	Soils & Aggregates	Labs 2 & 3
3/4" U.S. Standard Sieve	LA-0575	Soils & Aggregates	Labs 2 & 3
1/2" U.S. Standard Sieve	LA-0590	Soils & Aggregates	Labs 2 & 3
3/8" U.S. Standard Sieve	LA-0600	Soils & Aggregates	Labs 2 & 3
No. 4 U.S. Standard Sieve	LA-0625	Soils, Aggregates & Proctor	Labs 2, 3 & 5
No. 8 U.S. Standard Sieve	LA-0645	Soils & Aggregates	Labs 2 & 3
No. 16 U.S. Standard Sieve	LA-0665	Soils & Aggregates	Labs 2 & 3
No. 30 U.S. Standard Sieve	LA-0685	Soils & Aggregates	Labs 2 & 3
No. 50 U.S. Standard Sieve	LA-0705	Soils & Aggregates	Labs 2 & 3
No. 100 U.S Standard Sieve	LA-0725	Soils & Aggregates	Labs 2 & 3
U.S. Standard Sieve Cover	LA-0785	Soils & Aggregates & Proctor	Labs 2, 3 & 5
U.S. Standard Sieve Pan	LA-0770	Soils & Aggregates & Proctor	Labs 2, 3 & 5
Sieve Shaker	LA-0410	Soils & Aggregates & Proctor	Labs 2, 3 & 5
Fine Sieve Brush - Nylon	LA-0795	Soils & Aggregates & Proctor	Labs 2, 3 & 5
Fine Sieve Brush- Metal	LA-0800	Soils & Aggregates & Proctor	Labs 2, 3 & 5
4" Soil Compaction Set	LAG-3000	Proctor Soil Compaction	Lab 5
Concrete Slump Test Set	LAG-0035	Concrete Testing	Labs 6 & 7
Rubber Hammer	LA-0291	Concrete Testing	Labs 6 & 7
Concrete Thermometer	LA-0535	Concrete Testing	Labs 6 & 7
Strike Off Trowel	LA-0273	Concrete Testing	Labs 6 & 7
Stripping Tool	LA-0214	Concrete Testing	Labs 6 & 7
Plastic Concrete Molds	LA-0211	Concrete Testing	Labs 6 & 7

Round Mouth Scoop	LA-0294	Concrete Testing	Labs 6 & 7
Universal Materials Pan	LA-0285	Soils, Aggregate & Concrete	Labs 2,3,5,6 &7
Platform Scale	LA-0467	Concrete & Masonry	Labs 6, 7 & 8
Press-Aire Meter**	LA-0316	Concrete	Lab 7
Cura-Mold Curing Box**	LA-1300	Concrete	Labs 6 & 7
6 C.F. Wheel Barrow	N/A	Soils, Aggregates & Concrete	All Labs
5 Gallon Plastic Buckets	N/A	Soils, Aggregates & Concrete	All Labs
Terry Cloth Towels	N/A	Concrete	Labs 6 & 7
Universal Testing Machine**	To Be Determined	Concrete, Steel, Masonry & Wood	Labs 6, 7, 9, 10 & 11
Square Mouth Shovels	N/A	Soils, Aggregates & Concrete	All Labs
Aggregate & Sand Storage Bins	N/A	Concrete	Labs 6 & 7

*Laboratory No. 4 - Plastic and Liquid Limit Testing will be performed in CIVL 121 Heavy Construction Materials Course

** Columbus State Community College equipment may be made available.

Occupational Competency Analysis Profile:

Employability

Unit 1: Career Development

Competency 1.1: **Investigate career options** I11,M12

Competency Builders:

1.1.1 Determine interests and aptitudes
1.1.2 Identify career options
1.1.3 Research interests, knowledge, abilities, and skills needed in an occupation
1.1.4 Select careers that best match interests and aptitudes
1.1.5 Identify advantages and disadvantages of career options, including self-employment and nontraditional careers

Competency 1.2: **Utilize career information** I11,M12

Competency Builders:

1.2.1 Identify a range of career information resources
1.2.2 Use a range of resources to obtain career information (e.g., handbooks, career materials, labor market information, and computerized career-information delivery systems)
1.2.3 Demonstrate knowledge of various classification systems that categorize occupations and industries (e.g., *Dictionary of Occupational Titles*)
1.2.4 Describe the educational requirements of various occupations
1.2.5 Identify individuals in selected occupations as possible information resources, role models, or mentors
1.2.6 Describe the impact of factors such as population, climate, employment trends, and geographic location on occupational opportunities
1.2.7 Assess differences in the wages, benefits, annual incomes, cost of living, and job opportunties associated with selected career options
1.2.8 Determine labor market projections for selected career options

Competency 1.3: **Participate in a career exploration activity** I11,M12

Competency Builders:

1.3.1 Identify career exploration activities (e.g., job shadowing, mentoring, volunteer experiences, part-time employment, and cooperative education)
1.3.2 Compare traits, skills, and characteristics required for specific career choices with individual's traits, skills, and characteristics
1.3.3 Recognize potential conflicts between personal characteristics and career choice areas
1.3.4 Describe the impact of exploration activities on current career choices

Competency 1.4: **Assess the relationship between educational achievement and career planning** I11,M12

Competency Builders:

1.4.1 Describe how skills developed in academic and vocational programs relate to career goals
1.4.2 Describe how education relates to the selection of a college major, further training, and/or entry into the job market
1.4.3 Identify skills that can apply to a variety of occupational requirements
1.4.4 Explain the importance of possessing learning skills in the workplace

Competency 1.5: **Develop an individual career plan** I11,M12

Competency Builders:

1.5.1 Identify career goal(s)
1.5.2 Identify worker conditions, education, training, and employment opportunities related to selected career goal(s)
1.5.3 Describe school and community resources available to help achieve career goal(s)
1.5.4 Identify career ladders possible within selected career goal(s)*
1.5.5 Identify additional experiences needed to move up identified career ladders*
1.5.6 Recognize that changes may require retraining and upgrading of employees' skills

Competency 1.6: **Annually review/revise the individual career plan** I11,M12

Competency Builders:

1.6.1 Identify experiences that have reinforced selection of the specific career goal(s) listed on the individual career plan
1.6.2 Identify experiences that have changed the specific career goal(s) listed on the individual career plan
1.6.3 Modify the career goals(s) and educational plans on the individual career plan
1.6.4 Ensure that parents or guardians provide input into the individual career plan process
1.6.5 Identify the correlation between the individual career plan and the actual courses to be taken in high school
1.6.6 Identify the correlation between the individual career plan and postsecondary training, adult education, or employment

Unit 2: Decision Making and Problem Solving

Competency 2.1: **Apply decision-making techniques in the workplace** I11,M12

Competency Builders:

2.1.1 Identify the decision to be made
2.1.2 Compare alternatives
2.1.3 Determine the consequences of each alternative
2.1.4 Make decisions based on values and goals
2.1.5 Evaluate the decision made

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*Advancing

Competency 2.2: Apply problem-solving techniques in the workplace I11,M12

Competency Builders:

2.2.1 Diagnose the problem, its urgency, and its causes
2.2.2 Identify alternatives and their consequences in relation to the problem
2.2.3 Recognize multicultural and nonsexist dimensions of problem solving
2.2.4 Explore possible solutions to the problem using a variety of resources
2.2.5 Compare/contrast the advantages and disadvantages of each solution
2.2.6 Determine appropriate action
2.2.7 Implement action
2.2.8 Evaluate results of action implemented

Unit 3: Work Ethic

Competency 3.1: Evaluate the relationship of self-esteem to work ethic I11,M12

Competency Builders:

3.1.1 Identify special characteristics and abilities in self and others
3.1.2 Identify internal and external factors that affect self-esteem
3.1.3 Identify how individual characteristics relate to achieving personal, social, educational, and career goals
3.1.4 Identify the relationship between personal behavior and self-concept

Competency 3.2: Analyze the relationship of personal values and goals to work ethic both in and out of the workplace I11,M12

Competency Builders:

3.2.1 Distinguish between values and goals
3.2.2 Determine the importance of values and goals
3.2.3 Evaluate how one's values affect one's goals
3.2.4 Identify own short- and long-term goals
3.2.5 Prioritize own short- and long-term goals
3.2.6 Identify how one's values are reflected in one's work ethic
3.2.7 Identify how interactions in the workplace affect one's work ethic
3.2.8 Identify how life changes affect one's work ethic

Competency 3.3: Demonstrate work ethic I11,M12

Competency Builders:

3.3.1 Examine factors that influence work ethic
3.3.2 Display initiative
3.3.3 Demonstrate dependable attendance and punctuality
3.3.4 Demonstrate organizational skills
3.3.5 Adhere to schedules and deadlines
3.3.6 Demonstrate a willingness to learn
3.3.7 Demonstrate a willingness to accept feedback and evaluation
3.3.8 Demonstrate interpersonal skills required for working with and for others

Continued

Competency 3.3: Demonstrate work ethic—Continued

3.3.9 Describe appropriate employer-employee interactions for various situations
3.3.10 Express feelings and ideas in an appropriate manner for the workplace

Competency 3.4: Demonstrate safety skills I11,M12

Competency Builders:

3.4.1 Practice safe work habits
3.4.2 Identify safety hazards
3.4.3 Employ preventative safety measures
3.4.4 Demonstrate appropriate care and use of equipment and facilities to ensure safety
3.4.5 Comply with safety and emergency procedures

Unit 4: Job-Seeking Skills

Competency 4.1: Prepare for employment I11,M12

Competency Builders:

4.1.1 Identify traditional and nontraditional employment sources
4.1.2 Utilize employment sources
4.1.3 Research job opportunities, including nontraditional careers
4.1.4 Interpret equal employment opportunity laws
4.1.5 Explain the critical importance of personal appearance, hygiene, and demeanor throughout the employment process
4.1.6 Prepare for generic employment tests and those specific to an occupation/organization

Competency 4.2: Develop a résumé I11,M12

Competency Builders:

4.2.1 Identify personal strengths and weaknesses
4.2.2 List skills and/or abilities, career objective(s), accomplishments/achievements, educational background, work experience, volunteer/community contributions, and organizational memberships
4.2.3 Select an acceptable résumé format
4.2.4 Use correct grammar and spelling and concise wording
4.2.5 Secure references
4.2.6 Complete the résumé

Competency 4.3: Complete the job application process I11,M12

Competency Builders:

4.3.1 Explain the importance of an application form
4.3.2 Obtain job application forms
4.3.3 Demonstrate appropriate behaviors (e.g., personal appearance, hygiene, and demeanor) for obtaining job application forms in person
4.3.4 Describe methods for handling illegal questions on job application forms
4.3.5 Demonstrate legible written communication skills using correct grammar and spelling and concise wording

Continued

Competency 4.3: Complete the job application process—Continued

4.3.6 Return application to appropriate person
4.3.7 Request interview
4.3.8 Follow up on application status

Competency 4.4: Demonstrate interviewing skills I11,M12

Competency Builders:

4.4.1 Investigate interview procedures
4.4.2 Demonstrate appropriate behaviors (e.g. appearance, hygiene, and demeanor) for the interview
4.4.3 Demonstrate question-and-answer techniques
4.4.4 Demonstrate methods for handling difficult and/or illegal interview questions
4.4.5 Use correct grammar and concise wording

Competency 4.5: Secure employment I11,M12

Competency Builders:

4.5.1 Identify present and future employment opportunities within an occupation/organization
4.5.2 Research the organization/company
4.5.3 Use follow-up techniques to enhance employment potential
4.5.4 Evaluate job offer(s)
4.5.5 Respond to job offer(s)

Unit 5: Job Retention and Career Advancement Skills

Competency 5.1: Analyze the organizational structure of the workplace I11,M12

Competency Builders:

5.1.1 Identify employer expectations regarding job performance, work habits, attitudes, personal appearance, and hygiene
5.1.2 Comply with company policies and procedures
5.1.3 Examine the role/relationship between employee and employer
5.1.4 Recognize opportunities for advancement and reasons for termination
5.1.5 Recognize the organization's ethics.

Competency 5.2: Maintain positive relations with others I11,M12

Competency Builders:

5.2.1 Exhibit appropriate work habits and attitudes
5.2.2 Identify behaviors for establishing successful working relationships
5.2.3 Cooperate through teamwork and group participation
5.2.4 Demonstrate a willingness to compromise
5.2.5 Identify methods for dealing with harassment, bias, and discrimination based on race, color, national origin, gender, religion, disability, or age
5.2.6 Cooperate with authority
5.2.7 Accept supervision

Competency 5.3: Demonstrate accepted social and work behaviors I11,M12

Competency Builders

5.3.1 Demonstrate a positive attitude
5.3.2 Demonstrate accepted conversation skills
5.3.3 Use good manners
5.3.4 Accept responsibility for assigned tasks
5.3.5 Demonstrate personal hygiene
5.3.6 Demonstrate knowledge of a position
5.3.7 Perform quality work

Competency 5.4: Analyze opportunities for personal and career growth* I11,M12

Competency Builders:

5.4.1 Determine opportunities within chosen occupation/organization*
5.4.2 Determine other career opportunities outside chosen occupation/ organization*
5.4.3 Evaluate the factors involved in considering a new position within or outside an occupation/ organization*
5.4.4 Exhibit characteristics needed for advancement*

Unit 6: Technology in the Workplace

Competency 6.1: Demonstrate knowledge of technology issues I11,M12

Competency Builders:

6.1.1 Demonstrate knowledge of the characteristics of technology
6.1.2 Demonstrate knowledge of how technology systems are applied
6.1.3 Assess the impact of technology on the individual, society, and environment
6.1.4 Demonstrate knowledge of the evolution of technology
6.1.5 Identify how people, information, tools and machines, energy, capital, physical space, and time influence the selection and use of technology
6.1.6 Identify legal and ethical issues related to technology (e.g., confidentiality, information sharing, copyright protection)

Competency 6.2: Demonstrate skills related to technology issues I11,M12

Competency Builders:

6.2.1 Exhibit willingness to adapt to technological change
6.2.2 Utilize technological systems
6.2.3 Utilize a variety of resources and processes to solve technological problems
6.2.4 Employ higher-order thinking skills for solving technological problems
6.2.5 Work as a team member in solving technological problems
6.2.6 Use technology in a safe and responsible manner
6.2.7 Apply science, mathematics, communication, and social studies concepts to solve technological problems
6.2.8 Demonstrate ingenuity and creativity in the use of technology*
6.2.9 Utilize a formal method (systems approach) in solving technological problems*

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*Advancing

Unit 7: Lifelong Learning

Competency 7.1: Apply lifelong learning practices to individual situations I11,M12

Competency Builders:

7.1.1 Define lifelong learning
7.1.2 Identify factors that cause the need for lifelong learning
7.1.3 Identify changes that may require the retraining and upgrading of employee's skills
7.1.4 Identify avenues for lifelong learning
7.1.5 Participate in lifelong learning activities

Competency 7.2: Adapt to change I11,M12

Competency Builders:

7.2.1 Analyze the causes and effects of change
7.2.2 Identify the effect of change on goals
7.2.3 Identify the importance of flexibility when reevaluating goals
7.2.4 Evaluate the need for lifelong learning experiences in adapting to change

Unit 8: Economic Education

Competency 8.1: Analyze how an economy functions as a whole I11,M12

Competency Builders:

8.1.1 Describe how individuals and societies make choices to satisfy needs and wants with limited resources
8.1.2 Identify how production factors (land, labor, capital, and entrepreneurship) are used to produce goods and services
8.1.3 Illustrate how individuals and households exchange their resources for the income they use to buy goods and services
8.1.4 Explain how individuals and business firms use resources to produce goods and services to generate income
8.1.5 Identify characteristics of command, market, and traditional economies*
8.1.6 Describe how all levels of government assess taxes in order to provide services

Competency 8.2: Analyze how an economic system is a framework within which decisions are made by individuals and groups I11,M12

Competency Builders:

8.2.1 List several individuals and groups that make economic decisions at the local, state, and national levels
8.2.2 Identify the important roles that local, state, and national governments play in a market economy
8.2.3 List examples of how government decisions affect individuals

Continued

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*Advancing

Competency 8.2: Analyze how an economic system is a framework within which decisions are made by individuals and groups—Continued I11,M12

8.2.4 Identify how geographic locations affect the political and economic systems of the world
8.2.5 Evaluate how markets allocate goods and services
8.2.6 Explain how resources, goods, and services are exchanged in markets
8.2.7 Explain competition and its effect on the market

Competency 8.3: Analyze the importance of making informed personal financial decisions I11,M12

Competency Builders:

8.3.1 Describe the need for personal management records
8.3.2 Create a personal budget
8.3.3 Create a budget for a family of four for one month
8.3.4 Explain how credit affects personal/family finances
8.3.5 Identify steps to avoid credit problems
8.3.6 Make informed consumer choices in response to personal needs and wants
8.3.7 Identify factors that influence consumer decisions (e.g., advertisements, peer groups, price, and location)
8.3.8 Explain the costs and benefits for individuals of various types of taxation at the local, state, and federal levels

Unit 9: Balancing Work and Family

Competency 9.1: Analyze the effects of family on work I11,M12

Competency Builders:

9.1.1 Recognize how family values, goals, and priorities are reflected in the workplace
9.1.2 Identify present and future family structures and responsibilities
9.1.3 Describe personal and family roles
9.1.4 Analyze concerns of working parent(s)
9.1.5 Examine how family responsibilities can conflict with work
9.1.6 Identify ways to resolve family-related conflicts
9.1.7 Explain how to use support systems/community resources to help resolve family-related conflicts

Competency 9.2: Analyze the effects of work on family I11,M12

Competency Builders:

9.2.1 Identify responsibilities associated with paid and nonpaid work
9.2.2 Compare the advantages and disadvantages of multiple incomes
9.2.3 Explain how work can conflict with family responsibilities
9.2.4 Explain how work-related stress can affect families
9.2.5 Identify family support systems and resources

Unit 10: Citizenship in the Workplace

Competency 10.1: **Exercise the rights and responsibilities of citizenship in the workplace** I11,M12

Competency Builders:

10.1.1 Identify the basic rights and responsibilities of citizenship in the workplace
10.1.2 Identify situations in which compromise is necessary
10.1.3 Examine how individuals from various backgrounds contribute to the workplace
10.1.4 Demonstrate initiative to facilitate cooperation
10.1.5 Give/receive constructive criticism to enhance cooperation

Competency 10.2: **Prepare to work in a multicultural society** I11,M12

Competency Builders:

10.2.1 Identify ways to live in a multicultural society with mutual respect and appreciation for others
10.2.2 Examine how culture and experience create differences in people
10.2.3 Demonstrate respect for the contributions made by all people
10.2.4 Investigate personal cultural background as a means of developing self-respect
10.2.5 Make personal choices that reduce discrimination, isolation, and prejudice
10.2.6 Work effectively with people irrespective of their race, gender, religion, ethnicity, disability, age, or cultural background

Unit 11: Leadership

Competency 11.1: **Evaluate leadership styles appropriate for the workplace** I11,M12

Competency Builders:

11.1.1 Identify characteristics of effective leaders
11.1.2 Compare leadership styles
11.1.3 Demonstrate effective delegation skills
11.1.4 Investigate empowerment concepts
11.1.5 Identify opportunities to lead in the workplace

Competency 11.2: **Demonstrate effective teamwork skills** I11,M12

Competency Builders:

11.2.1 Identify the characteristics of a valuable team member
11.2.2 Identify methods of involving each team member
11.2.3 Contribute to team efficiency and success
11.2.4 Determine ways to motivate team members

Competency 11.3: **Utilize effective communication skills** I11,M12

Competency Builders:

11.3.1 Identify the importance of listening
11.3.2 Demonstrate effective listening skills
11.3.3 Demonstrate assertive communication techniques
11.3.4 Recognize the importance of verbal and nonverbal cues and messages
11.3.5 Prepare written material
11.3.6 Analyze written material
11.3.7 Give/receive feedback
11.3.8 Communicate thoughts
11.3.9 Use appropriate language
11.3.10 Follow oral and written instructions
11.3.11 Demonstrate effective telephone techniques
11.3.12 Identify technology in communications

Unit 12: Entrepreneurship

Competency 12.1: **Evaluate the role of small business** I11,M12

Competency Builders:

12.1.1 Identify the impact of small business on the local economy
12.1.2 Examine the relationship of small business to a national (USA) and global economy
12.1.3 Identify factors that contribute to the success of small business
12.1.4 Identify factors that contribute to the failure of small business
12.1.5 Identify the components of a business plan

Competency 12.2: **Examine entrepreneurship as a personal career option** I11,M12

Competency Builders:

12.2.1 Evaluate personal interests and skills
12.2.2 Compare personal interests and skills with those necessary for entrepreneurship
12.2.3 Determine motives for becoming an entrepreneur
12.2.4 Identify the advantages and disadvantages of owning a small business
12.2.5 Compare business ownership to working for others

HEART of OHIO TECH PREP CONSORTIUM

Pickerington High School

Construction Technology

Academic Competencies

August 15, 1996

Algebra II Competencies

+ indicates that this should have been mastered in a previous course. We will review this topic as it applies to our course, but we may not test on it.

** indicates the beginning of a specific competency. Other items with the same 5 numbers at the beginning are competency builders

- indicates introduction as time permits

The student will

**	3.01.01.00	Solve linear equations.
+	3.01.01.01	Combine like terms
+	3.01.01.02	Use the distributive property to remove grouping symbols and the addition/subtraction property to combine like terms to simplify expressions
+	3.01.01.03	Solve equations in one variable utilizing one operation
+	3.01.01.04	Solve equations in one variable utilizing two or more operations
+	3.01.01.05	Describe and use the logic of equivalence in working with equations, inequalities, and functions
	3.01.01.06	Identify variables, constants, terms, expressions, and coefficients
+	3.01.01.07	Define absolute value
	3.01.01.08	Evaluate algebraic expressions
	3.01.01.09	Solve a literal equation or formula for a specified variable, and use formulas
	3.01.01.10	Recognize the properties of equalities
	3.01.01.11	Solve 2x2 and 3x3 systems of equations by linear combination and by using matrices
+	3.01.01.12	Solve a 2x2 system of linear equations by substitution or elimination
+	3.01.01.13	Apply the rules for solving linear equations in one variable
	3.01.01.14	Use formulas
	3.01.01.15	Use handheld graphic calculators to solve linear equations and graph simple functions
	3.01.01.16	Solve linear equations in one variable containing an absolute value symbol
**	3.01.02.00	Understand and use the properties of exponents
+	3.01.02.01	Define exponent
+	3.01.02.02	Compare and compute using scientific notation
	3.01.02.03	Determine the roots of natural numbers using a calculator Use exponential form to write and evaluate radicals
	3.01.02.04	Determine the principal square root and recognize square roots of negatives as being imaginary
+	3.01.02.05	Divide terms having factors with exponents
	3.01.02.06	Multiply and divide polynomial expressions
	3.01.02.07	Operate with radicals and leave the answer in simplest radical form, as well as in decimal form to the nearest hundredth

	3.01.02.08	Apply the properties of exponents to simplify polynomial expressions
	3.01.02.09	Multiply terms having factors with exponents.
	3.01.02.10	Solve radical equations
**	3.01.03.00	Factor a polynomial of two or more terms; use the rational root theorem to choose appropriate choices of roots; use synthetic division to determine roots
	3.01.03.01	Apply the distributive property in removing common factors
	3.01.03.02	Factor the difference of two squares
	3.01.03.03	Factor quadratic trinomials
	3.01.03.04	Factor the sum and differences of perfect cubes
**	3.01.04.00	Solve inequalities in one variable and two variables and graph their solutions on a number line or coordinate plane
+	3.01.04.01	Combine like terms
+	3.01.04.02	Use the substitution property to evaluate expressions and formulas
+	3.01.04.03	Evaluate algebraic expressions
	3.01.04.10	Solve problems involving statements of inequality, including absolute value inequalities
**	3.01.05.00	Recognize, relate, and use the equivalent ideas of zeros of a function, roots of an equation, and the solution of an equation in terms of graphical and symbolic representation.
	3.01.05.10	Explore and describe characterizing features of functions
	3.01.05.11	Find x and y intercepts of a line
	3.01.05.12	Decide whether or not a relation is a function. Use function notation. Find domains and ranges
**	3.01.06.00	Graph equation in one and two variables, including graphs of conic sections, graphs of logarithmic equations and exponential equations, graphs of trigonometric equations.
	3.01.06.02	Explore and describe characterizing features of functions.
	3.01.06.03	Describe problem situations by using and relating numerical, symbolic, and graphical representations
	3.01.06.04	Use the language and notation of functions in symbolic and graphing settings
	3.01.06.06	Write equations for a line
	3.01.06.07	Use a graphing calculator or computer to generate the graph of a function
	3.01.06.08	Graph a linear equation using the slope-intercept method
	3.01.06.09	Translate among tables, algebraic expressions, and graphs of functions
	3.01.06.10	Estimate the shape of graphs of various functions and algebraic expressions
	3.01.06.12	Graph basic functions using the Cartesian coordinate system
**	3.01.07.00	Demonstrate the ability to translate statements and equations from written to algebraic form and algebraic form to written form.
**	3.01.08.00	Determine the slope, midpoint, and distance between two points
	3.01.08.01	Solve problems related to sets of points on a Cartesian coordinate system

**	3.01.09.00	Model real-world phenomena with polynomial and exponential functions, including the use of curve fitting to predict from data.
**	3.02.05.00	Solve right triangle problems using the Pythagorean theorem, and trigonometric ratios.
	3.02.05.01	Apply the Pythagorean theorem
	3.02.05.02	Identify basic functions of sine, cosine, and tangent
	3.02.05.03	Compute and solve problems using basic trig functions
**	3.02.06.00	Demonstrate inductive and deductive reasoning through application to various subject areas
+	3.02.06.01	Demonstrate an understanding of and ability to use proof
**	3.03.01.00	Estimate answers, compute, and solve problems involving real numbers.
+	3.03.01.01	Round off decimals to one or more places
+	3.03.01.02	Round and/or truncate numbers to designated place value
+	3.03.01.03	Round off single and multiple digit whole numbers
	3.03.01.04	Estimate measurements
+	3.03.01.05	Use mental computation when computer and calculator are inappropriate
**	3.03.02.00	Compare and contrast the real number system, the rational number system, and the whole number system.
**	3.03.03.00	Determine if a solution to a mathematical problem is reasonable (estimate)
**	3.03.04.00	Select and compute using appropriate units of measure.
**	3.04.01.00	Collect and organize data into tables, charts, and graphs
	3.04.01.01	Take a random sample from a population
**	3.04.02.00	Determine the probability of an event.
	3.04.02.01	Determine the probability of more than one event
-	3.04.02.02	Use computer simulations & random number generation to estimate probability
**	3.04.03.00	Understand and apply measures of central tendency, variability, and correlation.
	3.04.03.01	Compute and interpret mean
	3.04.03.02	Compute and interpret median and/or mode
	3.04.03.03	Understand what a normal distribution is
	3.04.03.04	Understand what a uniform distribution is
**	3.05.02.00	Solve systems of linear equations and inequalities using matrices, graphs, and algebraic methods.
	3.05.02.01	Solve systems of linear equations with up to 3 variables
	3.05.02.02	Solve a 3x3 system of linear equations using matrices
	3.05.02.03	Describe and solve algebraic situations with matrices
- **	3.05.03.00	Understand the complex number system and exhibit facility with its operation.
	3.05.03.01	Solve problems having complex solutions
	3.05.03.02	Examine complex numbers as zeros of functions
-	3.05.03.03	Graph basic functions using polar coordinate system
-	3.05.03.04	Graph using polar coordinates
-	3.05.03.05	Contrast and compare algebras of rational , real, and complex numbers with characteristics of a matrix algebra system

	3.05.03.06	Determine factors and roots of a polynomial with complex roots
-	3.05.03.07	Graph complex numbers
-	3.05.03.08	Add, subtract, multiply and divide complex numbers in rectangular and polar form
-	3.05.03.09	Convert complex numbers from rectangular form to the exponential
**	3.05.04.00	Analyze exponential and logarithmic functions.
	3.05.04.01	identify and define inverse functions
	3.05.04.02	Do calculations involving exponential and logarithmic expressions and functions
	3.05.04.03	Use definitions to show the relationship between exponential and logarithmic functions
	3.05.04.04	Graph the logarithmic and exponential functions
-	3.05.04.05	Describe and use the inverse relationship between functions including exponential and logarithmic
	3.05.04.06	Use graphing calculators to generate tables to plot exponential and logarithmic curves
	3.05.04.07	Use properties of logarithms to solve problems
-	3.05.04.08	Use graphing calculators to calculate logarithms in bases other than 10
	3.05.04.09	Solve elementary logarithmic and exponential equations
**	3.05.05.00	Simplify and solve quadratic equations
+	3.05.05.01	Simplify algebraic expressions and multiply and divide polynomials along with solving quadratic equations
	3.05.05.02	Solve a quadratic equation by factoring, by completing the square, and by using the quadratic formula
- **	3.06.01.00	Solve problems using the trigonometric functions
	3.06.01.01	Know the sign of each circular function in any quadrant
-	3.06.01.02	Know the circular functions of the special angles: $\pi / 6$, $\pi / 4$, $\pi / 3$
-	3.06.01.03	Define the circular functions on a circle of radius r with the center at the origin
-	3.06.01.04	Understand the relationship of the circular functions and the trig functions
-	3.06.01.05	Identify and use the trig functions for the sum of angles
	3.06.01.06	Solve right triangle problems
	3.06.01.08	Apply the law of sines in finding measures of sides and angles of triangles
	3.06.01.09	Apply the law of cosines in finding measure of sides and angles of triangles
-	3.06.01.10	Concert between radians and degrees
-	3.06.01.11	Solve problems with negative rotations
	3.06.01.12	Solve application problems involving right triangles
- **	3.06.02.00	Recognize and identify graphs of the trigonometric functions
-	3.06.02.01	Recognize and graph basic trig curves
-	3.06.02.02	Explore graphs in three dimensions
-	3.06.02.04	Solve trigonometric equations and verify trigonometric identities
-	3.06.02.05	Use the fundamental trig identities in performing operations
- **	3.06.03.00	Demonstrate an understanding in the use of vectors
	3.06.03.01	Apply vectors in problem solutions

-	3.06.04.02	Deduce properties of figures using vectors
	3.06.03.03	Develop and use vectors to represent distance and magnitude including operations
-	3.06.03.04	Explore relationships between complex numbers and vectors
-	3.06.03.05	Add and subtract vectors geometrically
-	3.06.03.06	Use graphing calculators in the study of vectors
-	3.07.01.00	Understand the connections between trigonometric functions, exponential functions, logarithmic functions, complex numbers, and series.
**	3.08.01.00	Look for and use appropriate problem solving strategies Select appropriate notation Look for a pattern Use simulation Make a graph Guess and check Make a drawing or diagram Make a model Construct a table Restate the problem Identify a subgoal Identify given, needed, and extraneous information Write an open sentence Solve a simpler or similar problem Work backwards Account for all possibilities
**	3.09.01.00	Understand and apply measurements and the probability that any measurement is accurate to some designated specification
**	3.10.01.00	Use estimation to eliminate choices in multiple-choice tests; use estimation to determine the reasonableness of an answer; use mental computation when appropriate

TechPrep College English 11

+ indicates that should have been mastered in a previous course.
* indicates the competency will be developed at this grade level and will be mastered at the next level (12 or Associate Degree).

Effective Reading Skills

Junior year:

* 1.01.01.00 Differentiate between fact, opinion, and inference.
* 1.01.02.00 Cite details that support or do not support predictions.
+ 1.01.03.00 Recognize the intent and use of propaganda.
* 1.01.04.00 Identify and summarize ideas, information, and events that are explicitly stated in written material.
+ 1.01.06.00 Identify and explain the main and subordinate ideas (stated or implied) in a written work.
* 1.01.07.00 Apply interpretive level comprehension skills to generate ideas and/or hypotheses about the content.
* 1.01.08.00 Find, understand, interpret, and apply information from a variety of sources (books, manuals, newspapers, periodicals, directories, reference works, computer printouts, and electronic sources).
* 1.01.09.00 Use the features of books and reference materials, such as table of contents, preface, introduction, titles and subtitles, index, glossary, appendix, and bibliography.
* 1.01.10.00 Define and use unfamiliar words and specialized vocabulary (including abbreviations, acronyms, concepts, and jargon) by using structural analysis,decoding, contextual clues, dictionaries, and computers.
* 1.01.12.00 Read and follow complex directions.
+ 1.01.13.00 Determine the author's purpose.
* 1.01.15.00 Recognize and interpret organizational patterns of writing (e.g. cause and effect, comparison and contrast, and simple listing).
* 1.01.18.00 Explore and analyze a variety of cultural elements, attitudes, beliefs, and value structures through reading.

Junior and senior year:

* 1.01.11.00 Read and understand short notes, memos, letters, and forms.
* 1.01.14.00 Read, evaluate, and respond critically to various literature forms, genres, and printed media.

Additional:

* Critique a variety of American literature (and British literature at the senior level) with regard to elements of literature and literary techniques.
* Compare/contrast genres of literature.

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* Read as a problem-solving strategy to clarify personal thinking and understanding.
* Engage in self-selected reading activities.

Effective Speaking and Presentation Skills:

Junior year:

+ 1.02.01.00 Give oral directions and clear explanations.
* 1.02.02.00 Participate critically and constructively in the exchange of ideas, particularly during class discussions and conferences.
+ 1.02.03.00 Demonstrate correct usage of vocabulary.
* 1.02.04.00 Demonstrate an awareness and understanding of interpersonal communication skills (verbal and nonverbal) in one-to-one and small group settings (role-playing).
* 1.02.05.00 Speak effectively using nonverbal communication such as eye contact, posture, and gestures.
+ 1.02.06.00 Select topics suitable to audience, situation, and purpose.
+ 1.02.11.00 Demonstrate proper telephone etiquette.

Junior/ senior year:
* 1.02.07.00 Demonstrate effective speaking skills in seeking employment and inutilizing management skills on the job.
* 1.02.08.00 Give formal and informal talks and speeches.
* 1.02.09.00 Demonstrate the difference between informing and persuading and use the appropriate techniques of content and delivery for each purpose.
+ 1.02.10.00 Use visual media.

Effective Writing Skills:

Junior/senior year:

+ 1.03.01.00 Demonstrate ability to use different forms of writing (e.g., literary response, business and technical communicative modes, personal responses, journals, research and recording).
+ 1.03.02.00 Demonstrate appropriate selection of mode, purpose, audience, point of view, and organization of information in written assignments.
* 1.03.03.00 Demonstrate expertise in word processing, graphics and/or desktop publishing aids for writing.
+ 1.03.04.00 Apply writing process techniques: prewriting, drafting, revising, editing/proofreading, publishing.
+ 1.03.05.00 Demonstrate ability to evaluate written assignments using a diagnostic rubric.

* 1.03.06.00 Develop and maintain a professional writing portfolio

Additional:

* Reinforce knowing/revising the traditional writing conventions (grammar, punctuation, capitalization, sentence structure).

* Reinforce attention to traditional genres: narration, exposition, persuasion as well as other forms of composition.

Effective Listening Skills (Most of these have been learned at other grade levels. All are at the reinforcement level, but special attention still needs to be given to several competencies at the reinforcement level.)

Junior year:

+ 1.04.01.00 Follow spoken directions.

+ 1.04.02.00 Distinguish between fact and opinion.

+ 1.04.06.00 Take accurate notes which summarize material presented from spoken conversations, including telephone messages.

Junior/senior year:

+ 1.04.03.00 Make inferences and draw conclusions from verbal and nonverbal messages.

+ 1.04.04.00 Identify and comprehend the main and subordinate ideas in lecture and discussions, questions to clarify information heard, and report accurately what others have said.

* 1.04.07.00 Recognize multi-cultural differences when listening.

Critical Viewing/Graphic/Observation Skills:

Junior year:

+ 1.05.01.00 Read and understand graphs, charts, and tables to obtain factual information.

* 1.05.02.00 Produce and utilize effective communication skills in development of graphs, tables, and charts to communicate ideas.

Junior/senior year:

+ 1.05.03.00 Critically view historical or contemporary events, via TV or videotape, and make appropriate observations.

* 1.05.04.00 Analyze the effects of advertising and other visual media for direct and hidden messages, including propaganda devices.

* 1.05.05.00 Communicate through use of videotape and computer presentations.

Civil Engineering Science Course of Study - Pickerington High School

Secondary Exit Competencies - Grade 11
r=review
i=introduce
m=master

Soils Unit
4.02.03.08 (r) Describe how human activities interfere with biological diversity. (ie. how modern practices affect the diversity of soil organisms.)

Hydrology Unit
4.02.03.06 (r) Explain and present examples of the importance of water to sustain life in terms of available water sources, water quality, and quantification.

Pollution Unit
4.02.03.07 (i) Explain interrelationship of wastewater collection, treatment, and public health in terms of organic and inorganic pollutant concentrations and pathogenic organisms.

Physical Geology Unit
4.02.03.05 (m) Identify ways to take responsibility for living in a global environment. (ie. Identify ways to minimize problems associated with mining and mineral exploration)

Chemistry Unit
4.01.01.00 (i) Explore atomic theory and present findings using various representational formats.
4.01.01.01 (i) Describe a mechanism of bond formation and identify the type of chemical bond formed as ionic, covalent, or metallic.
4.01.01.03 (r) Describe charge and ionic compounds in the context of electrochemical theories.
4.01.01.06 (r) Demonstrate knowledge of chemical symbolism which will include symbols, formulas, and equations.
4.01.02.01 (i) State a scheme of matter which includes elements, compounds, and mixtures.
4.03.03.02 (i) Define specific heat capacity and latent heat.

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Natural Disasters Unit
4.02.03.00 (r) Formulate an understanding of the relationship about organisms, their physical surroundings and their change process. (ie. how can mankind live in harmony with their surroundings)

Environmental Fundamentals Unit
4.05.01.07 (i) Identify problems rooted in science and technology (ie. the effects of hazardous waste on humans)
4.02.03.01 (r) Describe the interrelationship of an organism with its environment, including: pollution, populations, community, conservation, habitat, and ecosystem.

Scientific Processes Unit
4.04.01.00 (r) Identify and manipulate lab apparatus and materials safely.
4.04.02.00 (r) Demonstrate familiarity with lab safety equipment.
4.05.01.01 (r) Describe the role of observation and experimentation in the development of scientific theories.
4.05.01.02 (i) Describe the importance of using models in scientific thought.
4.05.01.04 (i) Investigate some of the ethical dilemmas of the scientist.
4.05.02.03 (r) Read scientific materials critically.
4.05.02.04 (r) Gather scientific information through library work.
4.05.02.05 (r) Investigate areas of specialization in science.
4.05.02.08 (r) Make predictions from data using concepts, laws, and theories.
4.05.02.10 (i) Predict the effects of changing variables in a given situation. (ie. changing ingredients in making concrete)
4.05.02.13 (r) Make direct measurements using laboratory apparatus.
4.05.02.14 (i) Design, conduct, and evaluate an experiment.
4.05.02.15 (r) Use sampling techniques.
4.05.02.17 (i) Analyze experimental designs.
4.05.03.00 (r) Using observations derived from experimental data, draw conclusions or make inferences.
4.05.03.02 (r) Interpret information presented in pictures, drawings, charts, graphs, mathematical expressions, and scientific literature.

Civil Engineering Science Course of Study - Pickerington High School

Secondary Exit Competencies for 12 grade (Physical Science B)

m = master
i = introduce

Chemistry Unit

m	4.01.01.00	Explore atomic theory and present findings using various representational formats.
m	4.01.01.01	Describe a mechanism of bond formation and identify the type of chemical bond formed as ionic, covalent, or metallic.
m	4.01.01.03	Describe charge and ionic compounds in the context of electrochemical theories.
m	4.01.01.06	Demonstrate knowledge of chemical symbolism which will include symbols, formulas, and equations.
m	4.01.02.01	State a scheme of matter which includes elements, compounds, and mixtures.
m	4.03.03.02	Define specific heat capacity and latent heat.
i	4.01.01.02	Relate the concept of periodicity to atomic properties and the periodic table of elements.
i	4.01.02.00	Perform investigations that require observations over varying periods of time concerning the interrelationship of matter and energy.
i	4.01.02.02	Relate a chemical equation to the concept of chemical change.
i	4.01.02.04	Predict the properties of matter based on data provided in pictures, drawings, charts, graphs, tables, mathematical expressions, and scientific literature.
i	4.01.02.05	Describe the conservation laws and correctly use the standard units for these laws in relation to conservation of mass/energy and conservation of change.
i	4.01.02.06	Describe properties of carbon and organic compounds.
i	4.01.02.07	State the laws of chemical combinations (conservation of mass, definite composition, multiple proportions).
i	4.01.02.08	List assumptions of the kinetic theory of matter.
i	4.01.02.10	Manipulate data in problem solving, including: mole, concentrate, gas law, atomic/molecular problems.
i	4.01.02.11	Discuss the concept of mole.
i	4.01.02.12	State the properties of gasses and laws that apply to gasses.
i	4.01.02.13	Identify applications of Avogadro's hypothesis such as Avogadro's number, molar volume, and gram molecular weight and molar mass.
i	4.01.02.14	Use the kinetic molecular theory to explain states of matter, rates of reaction, and chemical equilibrium.
i	4.01.02.15	Stoichiometric relationships.

Scientific Processes Unit

m	4.04.01.00	Identify and manipulate lab apparatus and materials safely.
m	4.04.02.00	Demonstrate familiarity with lab safety equipment.
m	4.05.01.01	Describe the role of observation and experimentation in the development of scientific theories.
m	4.05.01.02	Describe the importance of using models in scientific thought.
m	4.05.01.04	Investigate some of the ethical dilemmas of the scientist.
m	4.05.02.03	Read scientific materials critically.
m	4.05.02.04	Gather scientific information through library work.
m	4.05.02.05	Investigate areas of specialization in science.
m	4.05.02.08	Make predictions from data using concepts, laws, and theories.
m	4.05.02.10	Predict the effects of changing variables in a given situation. (ie. changing ingredients in making concrete)
m	4.05.02.13	Make direct measurements using laboratory apparatus.
m	4.05.02.14	Design, conduct, and evaluate an experiment.
m	4.05.02.15	Use sampling techniques.
m	4.05.02.17	Analyze experimental designs.
m	4.05.03.00	Using observations derived from experimental data, draw conclusions or make inferences.
m	4.05.03.02	Interpret information presented in pictures, drawings, charts, graphs, mathematical expressions, and scientific literature.

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TECH PREP

Construction Management

Planning Document for Equipment & Facilities

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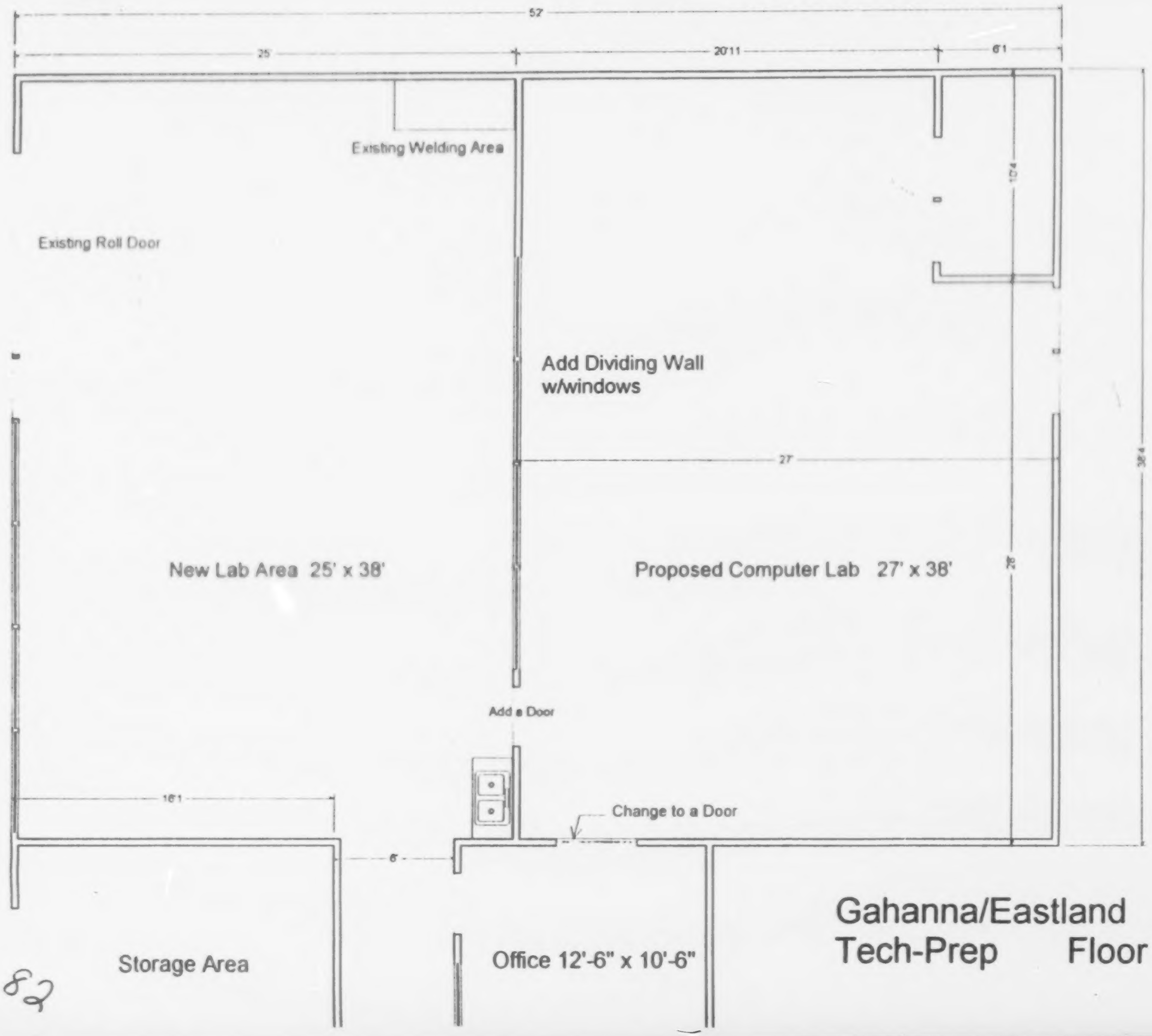
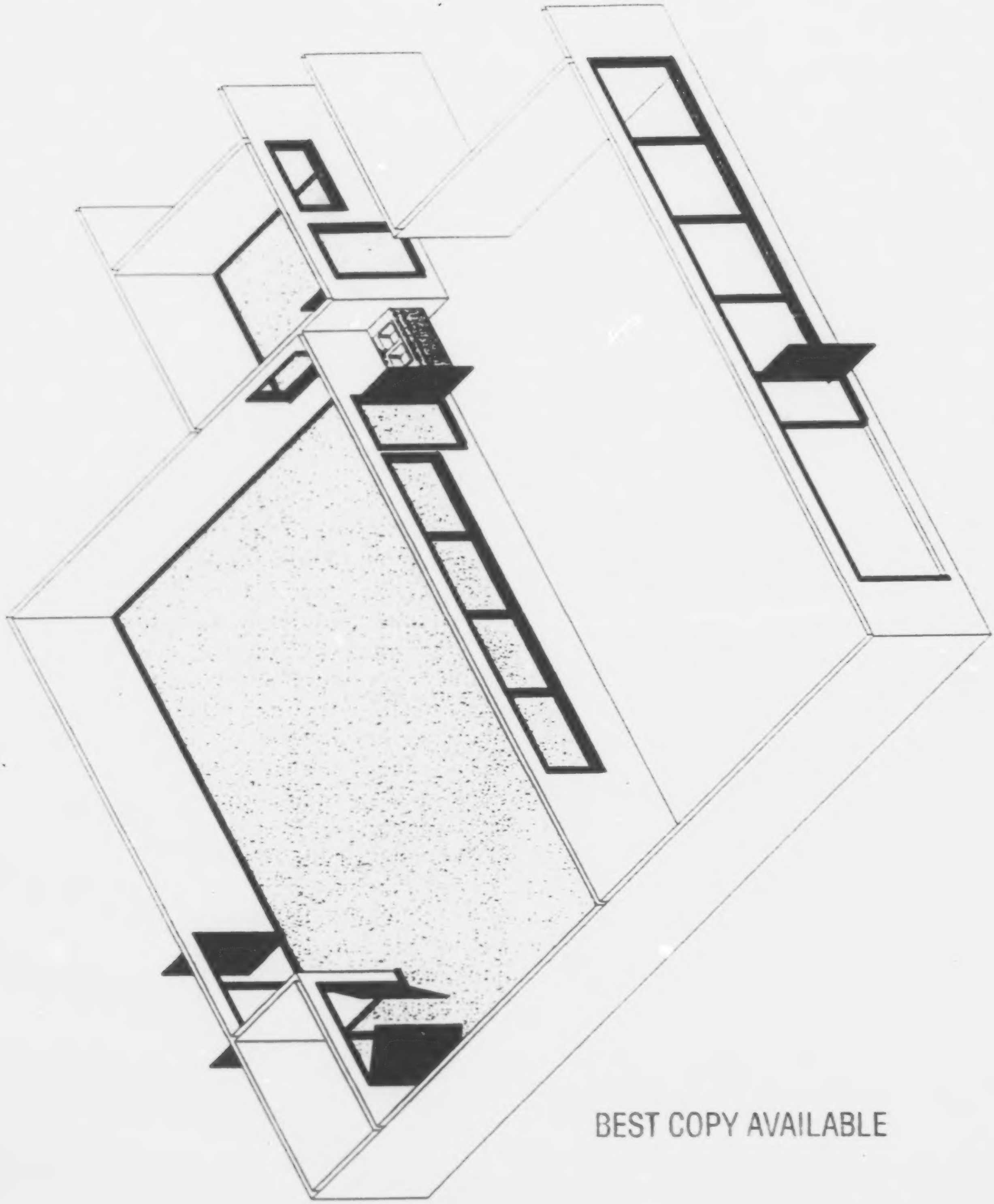


Gahanna/Eastland
Tech-Prep Floor Plan



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BASIC TOOLS FOR TECH-PREP / CONSTRUCTION

1-LASER TRANSIT W/TRIPOD

1-PNEUMATIC FRAMIING NAILER

1-AIR COMPRESSOR

1-POWER MITER BOX

6-24" CARPENTER SQUARES

16-6" SPEED SQUARES

4-STUDSENSORS

6-CHALK LINES

4-POWER HAND SAWS

6-HAND RIP SAWS

6-HAND CROSS CUT SAWS

2-POWER VARIABLE SPEED SAWZALLS

16-FRAMING HAMMERS

6-NAIL PULLERS

6-TWEAKED MULTI-USE TOOL

16-LEATHER TOOL BELTS

16-25' TAPE MEASURES

4-100' FIBERGLAS TAPE MEASURES

20-CONSTRUCTION HARD HATS

20-SAFETY GLASSES/GOGGLES

2-WHEEL BARRELS

2-MORTAR HOES

2-RAKES

6-BRICK CHISELS

4-BRICK TONGS

(Optional Equipment)

1-POWER CEMENT MIXER

6-BRICKLAYER'S HAMMERS

6-MASONRY TROWELS -10 X 4/34

6-MASONRY TROWELS -11 X 5 1/2

4-42" LEVELS

4-LINE LEVELS

4-WOOD BLOCK LINES (MASONRY)

6-MASONRY BRICK JOINTERS

16-UTILITY KNIVES

4-DRYWALL BOARDLIFTERS

6-DRYWALL KEYHOLE SAWS

6-8 X 3 DRYWALL TAPE KNIVES

4-12 X 3 DRYWALL TAPE KNIVES

6-6" JOINT KNIVES

4-POWER DRYWALL SCREWDRIVERS

1-POWER DRYWALL CUTOUT TOOL

4-DRYWALL CIRCLE CUTTERS

1-DRYWALL TAPER

10-DRYWALL SANDERS

6-PLASTIC MUD PANS

12-LONG NOSE SIDE CUT PLIERS

4-CABLE RIPPERS

12-ELECTRICAL PLIERS

12-STANDARD SCREW DRIVERS

12-PHILLIPS SCREW DRIVERS

4-CORDLESS DRILLS

4-50' EXTENSION CORDS

1-PORTABLE POWER SHEAR

CIVL 120 BASIC CONSTRUCTION MATERIALS
LABORATORY EQUIPMENT REQUIREMENTS
Based On Current Laboratory Numbering System*

Equipment Name	Forney Reference Number	Type of Testing	CIVL 120 Laboratory Project Number
Triple Beam Balance	LA-0470	Soil Moisture	Labs 1, 4 & 5
Balance Weight Set	LA-0475	Soil Moisture	Labs 1, 4 & 5
Soil Sample Tins (Containers)	LA-2583	Soil Moisture	Labs 1, 4 & 5
Sample Drying Oven 1.5√	LA-0886-70	Moisture Content	Labs 1,2,3,4,5 & 8
Double Beam Balance	Ohaus 20 Kg.	Aggregates	Lab 3
1.5 " U.S. Standard Sieve	LA-0563	Soils & Aggregates	Labs 2 & 3
3/4" U.S. Standard Sieve	LA-0575	Soils & Aggregates	Labs 2 & 3
1/2" U.S. Standard Sieve	LA-0590	Soils & Aggregates	Labs 2 & 3
3/8" U.S. Standard Sieve	LA-0600	Soils & Aggregates	Labs 2 & 3
No. 4 U.S. Standard Sieve	LA-0625	Soils, Aggregates & Proctor	Labs 2, 3 & 5
No. 8 U.S. Standard Sieve	LA-0645	Soils & Aggregates	Labs 2 & 3
No. 16 U.S. Standard Sieve	LA-0665	Soils & Aggregates	Labs 2 & 3
No. 30 U.S. Standard Sieve	LA-0685	Soils & Aggregates	Labs 2 & 3
No. 50 U.S. Standard Sieve	LA-0705	Soils & Aggregates	Labs 2 & 3
No. 100 U.S Standard Sieve	LA-0725	Soils & Aggregates	Labs 2 & 3
U.S. Standard Sieve Cover	LA-0785	Soils & Aggregates & Proctor	Labs 2, 3 & 5
U.S. Standard Sieve Pan	LA-0770	Soils & Aggregates & Proctor	Labs 2, 3 & 5
Sieve Shaker	LA-0410	Soils & Aggregates & Proctor	Labs 2, 3 & 5
Fine Sieve Brush - Nylon	LA-0795	Soils & Aggregates & Proctor	Labs 2, 3 & 5
Fine Sieve Brush- Metal	LA-0800	Soils & Aggregates & Proctor	Labs 2, 3 & 5
4" Soil Compaction Set	LAG-3000	Proctor Soil Compaction	Lab 5
Concrete Slump Test Set	LAG-0035	Concrete Testing	Labs 6 & 7
Rubber Hammer	LA-0291	Concrete Testing	Labs 6 & 7
Concrete Thermometer	LA-0535	Concrete Testing	Labs 6 & 7
Strike Off Trowel	LA-0273	Concrete Testing	Labs 6 & 7
Stripping Tool	LA-0214	Concrete Testing	Labs 6 & 7
Plastic Concrete Molds	LA-0211	Concrete Testing	Labs 6 & 7

Round Mouth Scoop	LA-0294	Concrete Testing	Labs 6 & 7
Universal Materials Pan	LA-0285	Soils, Aggregate & Concrete	Labs 2,3,5,6 &7
Platform Scale	LA-0467	Concrete & Masonry	Labs 6, 7 & 8
Press-Aire Meter**	LA-0316	Concrete	Lab 7
Cura-Mold Curing Box**	LA-1300	Concrete	Labs 6 & 7
6 C.F. Wheel Barrow	N/A	Soils, Aggregates & Concrete	All Labs
5 Gallon Plastic Buckets	N/A	Soils, Aggregates & Concrete	All Labs
Terry Cloth Towels	N/A	Concrete	Labs 6 & 7
Universal Testing Machine**	To Be Determined	Concrete, Steel, Masonry & Wood	Labs 6, 7, 9, 10 & 11
Square Mouth Shovels	N/A	Soils, Aggregates & Concrete	All Labs
Aggregate & Sand Storage Bins	N/A	Concrete	Labs 6 & 7

*Laboratory No. 4 - Plastic and Liquid Limit Testing will be performed in CIVL 121 Heavy Construction Materials Course

** Columbus State Community College equipment may be made available.

HEART of OHIO TECH PREP CONSORTIUM

1996

Construction Technologies Model

PART II.B:
Secondary Tech Prep
Academic Competencies (Unleveled)

HEART of OHIO TECH PREP CONSORTIUM

SECONDARY ACADEMIC COMPETENCIES

Reviewed & approved, October 1997

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PREFACE

How to Use This Competency List

The competencies listed in this document are exit competencies for the secondary component of Tech Prep programs. They represent what Tech Prep high school students are expected to be able to do by the end of grade 12.

Information offered in this preface includes:

- Philosophy underpinning Tech Prep academics
- Mathematics education as an example
- Bottom line for Tech Prep academics instruction
- Matrix indicating core and program-specific academic competencies
- Notes on organization of the competency list
- Acknowledgements

Background: What's Different about Tech Prep Academic Competencies?

Tech Prep is a systemic educational reform movement intended to prepare students for the technology-based occupations of the coming century. Here are some key points to know about Tech Prep secondary academics:

- ✔ Tech Prep academics are college preparatory academics for concrete learners. (That's 90% of all of us.)
- ✔ The goal is to prepare Tech Prep students to enter the college of their choice without the need for academic remediation.
- ✔ What makes Tech Prep academics different from traditional college prep academics is not the content. It is the way in which it is taught.

The following section uses *mathematics* as an example to illustrate the necessity for this approach, and some related methodologies.

Mathematics: A Prime Example

If we accept the premise that Tech Prep programs will demonstrate systemic educational change by providing new, creative, and innovative options for students, then we must agree that what has passed for mathematics education in the past will not and can not continue as mathematics education in the future.

The follow excerpts from current literature support this position:

> Evidence from many sources shows that the least effective mode for mathematics learning is the one that prevails in most of America's classrooms: lecturing and listening. Despite daily homework, for most students and most teachers mathematics continues to be primarily a passive activity: teachers prescribe; students transcribe. Students simply do not retain for long what they learn by imitation from lectures, worksheets, or routine homework. Presentation and repetition help students do well on standardized tests and lower-order skills, but they are generally ineffective as teaching strategies for long-term learning, for higher-order thinking, and for versatile problem solving. (National Research Council. Everybody Counts – A Report to the Nation on the Future of Mathematics Education. 1989, p. 57.)

The National Council of Teachers of Mathematics have proposed five general goals for all K-12 students:

> 1. That students learn to value mathematics,
> 2. That students become confident in their ability to do mathematics,
> 3. That students become mathematics problem-solvers,
> 4. That students learn to communicate mathematically, and
> 5. That students learn to reason mathematically....
>
> Toward this end, we see classrooms as places where interesting problems are regularly explored using important mathematical ideas. Our premise is that ***what*** a student learns depends to a great degree on ***how*** he or she has learned it.... This vision sees students studying much the same mathematics currently taught, but with quite a different emphasis. (NCTM. Curriculum and Evaluation Standards for School Mathematics. 1989, p. 5.)

For NCTM's vision for mathematics education to be realized, the vision of how students learn mathematics must shift "toward investigating, formulating, representing, reasoning, and applying a variety of strategies to the solution of problems . . . and away from being shown or told, memorizing and repeating.... {And the] role of teachers toward 'questioning and listening' . . . and away from 'telling' students what to do..." (NCTM, Assessment Standards for School Mathematics,1995, p. 2).

Alternative methods for delivery of mathematics education should address the following:

1. Students should experience mathematics as active, engaging, and dynamic.
2. Mathematics instruction should at all times make appropriate use of technology, especially graphing calculators and computers.
3. Mathematics courses should make extensive use of writing assignments, open-ended projects, and cooperative learning groups.
4. Faculty should use a variety of teaching strategies and should employ a broad range of examples.

(Mathematical Sciences Education Board. Expectations for Mathematics Education from High School through Career.)

The Bottom Line for Teaching

As shown above, we can not continue to teach mathematics — or for that matter, any high school academics — the way they have always been taught. The Heart of Ohio Tech Prep Consortium officially encourages the kind of systemic change spelled out in the example just presented using mathematics education.

In other words, TECH PREP HIGH SCHOOL ACADEMIC INSTRUCTION SHOULD --

☞ **Focus on developing critical thinking and problem-solving skills**

☞ **Incorporate cooperative learning techniques**

☞ **Include written group projects, developed in conjunction with business and industry, that address real-world problems**

☞ **Actively embrace career development and school-to-work opportunities**

☞ **Encourage global thinking and learning through multidisciplinary instruction, projects, and experiences**

Core Academic Competencies and Program-Specific Competencies

The matrix on the next page shows--

1. Core competencies required of ALL TECH PREP STUDENTS by the time they complete high school.

2. Program-specific competencies required by the end of grade 12 FOR STUDENTS WHO SELECT A PARTICULAR TECH PREP SECONDARY PROGRAM that is linked with one or more college Tech Prep programs.

Important notes:

✔ The grade and sequence in which Tech Prep academic competencies are taught are up to the local school (though in some cases, this is determined naturally by progression of prerequisite skills).

✔ Regardless of the sequence, every student completing a high school Tech Prep program should have attained the academic competencies (both core and program-specific) by the time he or she completes the high school Tech Prep program.

✔ The core competencies and program-specific competencies required by the end of grade 12 are the minimum requirements for successful completion of the high school Tech Prep program and subsequent matriculation into a college Tech Prep program. If time and resources allow, any school may choose to enrich its Tech Prep programs by teaching additional competencies that enhance the students' college and/or employment readiness.

✔ Instructors will notice that competencies listed in their discipline are generally equivalent to the college prep content they already teach (e.g., Algebra I, Geometry, Biology, Global History, etc.).

✔ Schools are advised to retain traditional names for academic courses (e.g.,.Algebra II, English IV) on the student's official transcript, to support their acceptance by selective-admissions colleges and universities, as well as for scholarship eligibility (e.g., NCAA). Although schools may organize and sequence Tech Prep academic course content differently from traditional college preparatory courses, students should have attained all of the requisite competencies by the end of grade 12, thereby addressing the expectations of these organizations.

MATRIX NO. 1:
CORE ACADEMIC COMPETENCIES REQUIRED OF ALL TECH PREP STUDENTS BY THE END OF GRADE 12

ACADEMIC COMPETENCIES				Individual Development Competencies	Technology Literacy Competencies	Professional Options (Technical & Employability Competencies)
Communications Literacy*	Mathematics Literacy*	Science Literacy*	Social/Cultural Literacy*			
All competencies listed	• Algebra • Numbers & number relations • Data analysis & probability	• Lab safety procedures • Scientific process • Biology/ecology	All competencies listed	All competencies listed	All competencies listed	See specific program model (separate document)
*Four years of college-prep English	*Minimum three years of college prep mathematics -- see Matrix No. 2 for additional program-specific requirements	*Minimum two years of lab science, one of which is biology — see Matrix No. 2 for additional program-specific requirements	*Four years of college-prep humanities			

MATRIX NO. 2:
ADDITIONAL ACADEMIC COMPETENCIES REQUIRED FOR SPECIFIC TECH PREP PROGRAMS IN GRADES 11-12*

(*In addition to core competencies required of all students)

TECH PREP PROGRAM MODEL (Gr. 11-12)	Mathematics Literacy Competencies*	Science Literacy Competencies*	Professional Options Competencies (Technical & Employability)
Automotive/Diagnostic Technologies	• Geometry • Technical Algebra	• Chemistry • Physics	See separate program model documentation
Business Technologies Core Model:			
■ Computerized Business Technology (CBT) Career Major	• Geometry • Technical Algebra	• Chemistry or Physics *(recommended but not required)*	See separate program model documentation
■ Business Management Career Major *(in process)*	TBA	TBA	TBA
Construction Technologies	• Technical Algebra • Geometry and/or Technical Trigonometry *(recommended but not required)*	• Physics • Chemistry *(recommended by not required)*	See separate program model documentation
Engineering Technologies Core Model:			
■ Architecture/ Construction Career Major	Select two: • Technical Algebra • Geometry • Technical Trigonometry	• Chemistry • Physics	See separate program model documentation

MATRIX NO. 2:
ADDITIONAL ACADEMIC COMPETENCIES REQUIRED FOR SPECIFIC TECH PREP PROGRAMS IN GRADES 11-12*

(*In addition to core competencies required of all students)

TECH PREP PROGRAM MODEL (Gr. 11-12)	Mathematics Literacy Competencies*	Science Literacy Competencies*	Professional Options Competencies (Technical & Employability)
Engineering Core Model program, continued:	Select two: • Technical Algebra • Geometry • Technical Trigonometry	• Chemistry • Physics	See separate program model
▪ Design Engineering Career Major			
▪ Electronics Technology Career Major			
▪ Graphic Communications Career Major			
▪ Landscape Career Major			
▪ Manufacturing Career Major			
Environmental Technologies	• Geometry • Technical Algebra	• Chemistry • Environmental Geology *(specific to this program; see separate program model documentation)*	See separate program model documentation
Information Engineering Technologies	• Geometry • Technical Algebra	• Chemistry • Physics	See separate program model documentation
Multi-Competency Health Technologies ("Allied Health")	• Technical Algebra	• Chemistry	See separate program model documentation

Notes on Organization of the Competency List

- Numbering format:
  Category
    Subcategory
      Competency (*9.03.12.00)
        Competency Builder (9.03.12.11)

- An asterisk (*) indicates that the statement is a competency. Others are competency builders. Competency statements always end with ".00" in the builder columns.

- Categories:
  1 = Communications Literacy ...... 47 competencies
  2 = Individual Development .... 11 competencies
  3 = Mathematics Literacy .... 30 competencies
  4 = Science Literacy .... 16 competencies
  5 = Social/Cultural Literacy .... 21 competencies
  6 = Technology Literacy .... 26 competencies
  151 total

- Professional Options (technical) competencies are not included. The set of specific technical competencies used will depend on the particular Tech Prep program model. These are contained in separate documents available from each school's representative to the Tech Prep Consortium Implementation Committee.

- Communications Literacy competencies do not include builders.

- Individual Development category does not include subcategories.

Acknowledgements

The original version of this competencies list (1992-94) was developed and reviewed by over 80 representatives of K-12 and higher education institutions as well as members of business, industry, and labor organizations who donated their time to help Tech Prep get on its feet in Central Ohio. The current version was reviewed and approved by representatives of Ohio University, Columbus State Community College, and the Curriculum Pathways Committee of the Heart of Ohio Tech Prep Consortium. The preface was prepared by Leigh Trapp, Larry Lance, and Connie Faddis. A special thank you goes to Dr. John Furlow of OU-Lancaster, Dr. David Hockenbery of Columbus State, and Larry Lance of Columbus State.

COMMUNICATIONS LITERACY COMPETENCIES

Effective Reading Skills

*1.01.01.00 Differentiate between fact, opinion, and inference.

*1.01.02.00 Cite details that support or do not support predictions.

*1.01.03.00 Recognize the intent and use of propaganda.

*1.01.04.00 Identify and summarize ideas, information, and events that are explicitly stated in written material.

*1.01.05.00 Explain the sequence of time, places, events, and ideas.

*1.01.06.00 Identify and explain the main and subordinate ideas (stated or implied) in a written work.

*1.01.07.00 Apply interpretive level comprehension skills to generate ideas and/or hypotheses about the content.

*1.01.08.00 Find, understand, interpret, and apply information from a variety of sources (books, manuals, newspapers, periodicals, directories, reference works, computer printouts, and electronic sources).

*1.01.09.00 Use the features of books and reference materials, such as table of contents, preface, introduction, titles and subtitles, index, glossary, appendix, and bibliography.

*1.01.10.00 Define and use unfamiliar words and specialized vocabulary (including abbreviations, acronyms, concepts, and jargon) by using structural analysis, decoding, contextual cues, dictionaries, and computers.

*1.01.11.00 Read and understand short notes, memos, letters, and forms.

*1.01.12.00 Read and follow complex directions.

*1.01.13.00 Determine the author's purpose.

*1.01.14.00 Read, evaluate, and respond critically to various literature forms, genres, and printed media.

*1.01.15.00 Recognize and interpret organizational patterns of writing (e.g., cause and effect, comparison and contrast, and simple listing).

*1.01.16.00 Identify the structural elements of literature (e.g., plot, theme, character, mood, setting, and point of view).

*1.01.17.00 Identify literary devices (e.g., metaphor, foreshadowing, flashback, allusion, satire, and irony).

*1.01.18.00 Explore and analyze a variety of cultural elements, attitudes, beliefs, and value structures through reading.

Effective Speaking and Presentation Skills

*1.02.01.00 Give oral directions and clear explanations.

*1.02.02.00 Participate critically and constructively in the exchange of ideas, particularly during class discussions and conferences with individuals.

*1.02.03.00 Demonstrate correct usage of vocabulary.

*1.02.04.00 Demonstrate an awareness and understanding of interpersonal communication skills (verbal and nonverbal) in one-to-one and small group settings (role playing).

*1.02.05.00 Speak effectively using nonverbal communication such as eye contact, posture, and gestures.

*1.02.06.00 Select topics suitable to audience, situation, and purpose.

*1.02.07.00 Demonstrate effective speaking skills in seeking employment and in utilizing management skills on the job.

*1.02.08.00 Give formal and informal talks and speeches.

*1.02.09.00 Demonstrate the difference between informing and persuading and use the appropriate techniques of content and delivery for each purpose.

*1.02.10.00 Use visual media.

*1.02.11.00 Demonstrate proper telephone etiquette.

Effective Writing Skills

*1.03.01.00 Demonstrate ability to use different forms of writing (e.g., literary response, business and technical communicative modes, personal responses, journals, research and recording).

*1.03.02.00 Demonstrate appropriate selection of mode, purpose, audience, point of view, and organization of information in written assignments.

*1.03.03.00 Demonstrate expertise in word processing, graphics, and/or desktop publishing aids for writing.

*1.03.04.00 Apply writing process techniques: 1) Prewriting, 2) Drafting, 3) Revising, 4) Editing/proofreading, 5) Publishing.

*1.03.05.00 Demonstrate ability to evaluate written assignments using a diagnostic rubric.

*1.03.06.00 Develop and maintain a professional writing portfolio.

Listening Skills

*1.04.01.00 Follow spoken directions.

*1.04.02.00 Distinguish between fact and opinion.

*1.04.03.00 Make inferences and draw conclusions from verbal and nonverbal messages.

*1.04.04.00 Identify and comprehend the main-and subordinate ideas in lecture and discussions, questions to clarify information heard, and report accurately what others have said.

*1.04.05.00 Restate or paraphrase a conversation to confirm one's own understanding of what was said.

*1.04.06.00 Take accurate notes which summarize material presented from spoken conversations, including telephone messages.

*1.04.07.00 Recognize multi-cultural differences when listening.

Critical Viewing/Graphic/Observation Skills

•1.05.01.00 Read and understand graphs, charts, and tables to obtain factual information.

•1.05.02.00 Produce and utilize effective communication skills in the development of graphs, tables, and charts to communicate ideas.

•1.05.03.00 Critically view historical or contemporary events, via TV or video tape, and make appropriate observations.

•1.05.04.00 Analyze the effects of advertising and other visual media for direct and hidden messages, including propaganda devices.

•1.05.05.00 Communicate through use of video tape and computer presentations.

INDIVIDUAL DEVELOPMENT

•2.00.01.00 Apply critical thinking skills to personal, family, and work problems for the well-being of self and others

2.00.01.01 Differentiate between facts and assumptions.

2.00.01.02 Develop inferences from data.

2.00.01.03 Demonstrate an ability to evaluate arguments.

2.00.01.04 Utilize deductive logic by predicting specific phenomena from general statements.

•2.00.02.00 Apply problem-solving process to personal, family, and work-related problems for well-being of self and others

2.00.02.01 Analyze and clarify own value structure.

2.00.02.02 Evaluate the relationship between values and goals

2.00.02.03 Establish priorities for short and long-term goals

2.00.02.04 Describe the importance of flexibility when reevaluating goals

2.00.02.05 Manage resources to achieve goals

2.00.02.06 Identify adequate reliable information and resources for personal, family, and work-related problem solving.

2.00.02.07 Create solutions to problems using technical means

2.00.02.08 Compare and contrast the advantages and disadvantages of several solutions to a problem.

2.00.02.09 Evaluate outcomes of a decision.

2.00.02.10 Apply decision-making techniques in the workplace

2.00.02.11 Apply technical problem solving abilities and creative talents to situations in the workplace

- •2.00.03.00 Assume a leadership role as a responsible family member and citizen
  - 2.00.03.01 Evaluate leadership styles appropriate for the workplace and/or home
  - 2.00.03.02 Identify ways to be a responsible citizen at home, at school, at work, and in community settings
  - 2.00.03.03 Develop effective communication skills.
  - 2.00.03.04 Determine ways to motivate others
  - 2.00.03.05 Demonstrate initiative to facilitate cooperation
- •2.00.04.00 Build and maintain constructive interpersonal relationships
  - 2.00.04.01 Assess and be sensitive to others' feelings and point of view
  - 2.00.04.02 Examine how individuals from various backgrounds contribute to work and personal situations
  - 2.00.04.03 Identify ways to work cooperatively with others of diverse background
  - 2.00.04.04 Analyze strategies to manage conflict
  - 2.00.04.05 Cooperate and compromise through teamwork and group participation
  - 2.00.04.06 Develop communication patterns that enhance family relationships
  - 2.00.04.07 Identify characteristics of love and commitment with family, friends, and others
  - 2.00.04.08 Understand ways to build and maintain strong, functional families
  - 2.00.04.09 Understand ways to build positive parent-child relationships
  - 2.00.04.10 Enhance personal development of self and others throughout the lifespan
  - 2.00.04.12 Develop a life-management plan
- •2.00.05.00 Develop skills to successfully cope with changes taking place in society.
  - 2.00.05.01 Analyze the effects of change
  - 2.00.05.02 Identify strategies for dealing with family change and stress

2.00.05.03 Identify family and work support resources and services

2.00.05.04 Evaluate the need for continuing education and training

2.00.05.05 Implement strategies to manage the effects of stress

*2.00.06.00 Identify management strategies for balancing work and family roles and responsibilities

2.00.06.01 Analyze the effects of work on family

2.00.06.02 Analyze the effects of family on work

2.00.06.03 Describe personal and family roles and issues

2.00.06.04 Identify present and future family structures and responsibilities

2.00.06.05 Analyze concerns of working parent(s)

2.00.06.06 Evaluate importance of responsible parenting for individuals, families, and society

2.0.0.06.07 Coordinate personal and career responsibilities for well-being of self and others

*2.00.07.00 Develop strategies for lifelong career planning

2.00.07.01 Assess knowledge, attitudes, skills, and aspirations

2.00.07.02 Develop an awareness of careers and skills in a technological society.

2.00.07.03 Complete and process job application forms

2.00.07.04 Design a resume

2.00.07.05 Demonstrate interviewing skills

2.00.07.06 Compare and evaluate job opportunities

2.00.07.07 Analyze organizational structures of the workplace

2.00.07.08 Assess factors influencing wages, annual incomes, and job opportunities

2.00.07.09 Identify strategies for keeping a job, advancing in a job, and increasing wages

2.00.07.10 Evaluate factors involved when assuming a new position within or outside an occupation/ organization

2.00.07.11 Identify strategies for dealing with career successes, changes, and/or disappointments

2.00.07.12 State the approximate number of years a person can expect to work after leaving high school.

2.00.07.13 Compare the advantages and disadvantages of multiple incomes

2.00.07.14 Analyze opportunities for personal and career growth

2.00.07.15 Evaluate career choices in relation to life-management plan

2.00.07.16 Formulate plan to achieve career goals

*2.00.08.00 Develop habits and attitudes that reflect an appropriate work ethic.

2.00.08.01 Analyze the value of work ethic in relation to personal and family values and goals

2.00.08.02 Evaluate the relationship of self-esteem to work ethic

2.00.08.03 Follow directions.

2.00.08.04 Identify strategies to improve workplace policies and attitudes that support individuals and families.

2.00.08.05 Develop a positive attitude

2.00.08.06 Develop time management skills.

*2.00.09.00 Establish a plan for using resources to meet individual and family needs and goals

2.00.09.01 Analyze consumer rights and responsibilities

2.00.09.02 Make informed consumer choices for the well-being of self and others

2.00.09.03 Discuss the role of competitiveness in a global society.

2.00.09.04 Make decisions related to selecting, obtaining, and maintaining clothing for self and family

2.00.09.05 Evaluate financial institutions and services (e.g., savings, investments, credit).

2.00.09.06 Plan strategies to facilitate self-responsibility in managing a financial plan

•2.00.10.00 Evaluate entrepreneurship as a career option

2.00.10.01 Evaluate the role of small business in the economy

2.00.10.02 Analyze opportunities for new business.

2.00.10.03 Examine considerations of starting a business

2.00.10.04 Analyze responsibilities involved in managing a business .

2.00.10.05 Examine factors involved in obtaining financing.

2.00.10.06 Examine importance of effective record keeping.

2.00.10.07 Examine factors involved in selecting a business location.

2.00.10.08 Analyze importance of a customer service policy.

2.00.10.09 Analyze how laws affect small business operations.

2.00.10.10 Examine components of a marketing plan.

2.00.10.11 Analyze importance of a business plan.

•2.00.11.00 Make choices that promote wellness and good health for self and others

2.00.11.01 Describe the significance of a healthy lifestyle

2.00.11.02 Analyze interrelationship between food choices and wellness

2.00.11.03 Identify strategies to promote optimal nutrition and wellness of individuals and families

2.00.11.04 Prepare and serve nutritious foods

2.00.11.05 Demonstrate proper use of equipment

2.00.11.06 Maintain safe work and home environment

2.00.11.07 Identify substance use, abuse, and its effects on individuals, families, work and society.

2.00.11.08 Enhance self-esteem of self and others

2.00.11.09 Distinguish between responsible and irresponsible ways to express emotional and physical intimacy

2.00.11.10 Examine the role of the arts in cultural expression and identity.

2.00.11.11 Explore the significance of a variety of art forms.

MATHEMATICS LITERACY

Algebra

•3.01.01.00 Solve linear equations.

3.01.01.01 Combine like terms.

3.01.01.02 Use the Distributive Property to remove grouping symbols and the Addition/Subtraction Property to combine like terms to simplify expressions.

3.01.01.03 Solve equation in one variable utilizing one operation.

3.01.01.04 Solve equations in one variable utilizing two or more operations.

3.01.01.05 Describe and use the logic of equivalence in working with equations, inequalities, and functions.

3.01.01.06 Identify variables, constants, terms, e expressions, and coefficients.

3.01.01.07 Define absolute value.

3.01.01.08 Evaluate algebraic expressions.

3.01.01.09 Solve the literal equation or formula for a specified variable.

3.01.01.10 Recognize the properties of equalities.

3.01.01.11 Solve a 2x2 system of linear equations by elimination.

3.01.01.12 Solve a 2x2 system of linear equations by substitution.

3.01.01.13 Apply the rules for solving linear equations in one variable.

3.01.01.14 Use formulas.

3.01.01.15 Use handheld graphic calculators to solve linear equations and graph simple functions.

3.01.01.16 Solve linear equations in one variable containing an absolute value symbol.

•3.01.02.00 Use properties of exponents.

- 3.01.02.01 Define exponent.
- 3.01.02.02 Compare and compute using scientific notation.
- 3.01.02.03 Determine values for the square root of any natural number.
- 3.01.02.04 Determine the principal square root and recognize square roots of negatives as being non-real.
- 3.01.02.05 Divide terms having factors with exponents.
- 3.01.02.06 Multiply and divide polynomial expressions.
- 3.01.02.07 Operate with radicals and leave the result in simplified form.
- 3.01.02.08 Apply the properties of exponents to simplify polynomial expressions.
- 3.01.02.09 Multiply terms having factors with exponents.
- 3.01.02.10 Solve radical equations.

•3.01.03.00 Factor a polynomial of two or more terms.

- 3.01.03.01 Apply the distributive law in removing common factors.
- 3.01.03.02 Factor difference of two squares.
- 3.01.03.03 Factor quadratic trinomials.
- 3.01.03.04 Factor the sum and differences of perfect cubes.

•3.01.04.00 Solve linear inequalities and show the solution on a number line.

- 3.01.04.01 Combine like terms.
- 3.01.04.02 Use the Substitution Property to evaluate expressions and formulas.
- 3.01.04.03 Evaluate algebraic expressions.
- 3.01.04.04 Use the Distributive Property to remove grouping symbols and the Addition/Subtraction Property to combine like terms to simplify expressions.

3.01.04.05 Identify variables, constants, terms, expressions, and coefficients.

3.01.04.06 Solve equations in one variable utilizing two or more operations.

3.01.04.07 Describe and use the logic of equivalence in working with equations, inequalities, and functions.

3.01.04.08 Solve a linear inequality in one variable using two or more operations.

3.01.04.09 Define absolute value.

3.01.04.10 Solve problems involving statements of inequality.

•3.01.05.00 Recognize, relate, and use the equivalent ideas of zeros of a function, roots of an equation, and solution of an equation in terms of graphical and symbolic representations.

3.01.05.01 Apply the distributive law in removing common factors.

3.01.05.02 Factor the difference of two squares.

3.01.05.03 Factor quadratic trinomials.

3.01.05.04 Combine like terms.

3.01.05.05 Use the Distributive Property to remove grouping symbols and the Addition/Subtraction Property to combine like terms to simplify expressions.

3.01.05.06 Solve equation in one variable utilizing one operation.

3.01.05.07 Solve equations in one variable utilizing two or more operations.

3.01.05.08 Describe and use the logic of equivalence in working with equations, inequalities, and functions.

3.01.05.09 Identify variables, constants, terms, expressions, and coefficients.

3.01.05.10 Explore and describe characterizing features of functions.

3.01.05.11 Find X and Y intercepts of a line.

3.01.05.12 Decide whether or not a relation is a function. Use function notation. Find domains and ranges.

- *3.01.06.00 Graph equations.
    - 3.01.06.01 Develop graphical techniques of solution for problem situations involving functions
    - 3.01.06.02 Explore and describe characterizing features of functions.
    - 3.01.06.03 Describe problem situations by using and relating numerical, symbolic, and graphical representations
    - 3.01.06.04 Use the language and notation of functions in symbolic and graphing settings.
    - 3.01.06.05 Find X and Y intercepts of a line.
    - 3.01.06.06 Write equations for a line.
    - 3.01.06.07 Use a graphing calculator or computer to generate the graph of EL function.
    - 3.01.06.08 Graph a linear equation using the slope-intercept method.
    - 3.01.06.09 Translate among tables, algebraic expressions, and graphs of functions
    - 3.01.06.10 Estimate shape of graphs of various functions and algebraic expressions.
    - 3.01.06.11 Use handheld graphic calculators to solve linear equations and graph simple functions.
    - 3.01.06.12 Graph basic functions using Cartesian coordinate system.
- *3.01.07.00 Demonstrate the ability to translate statements and equations from written to algebraic form and algebraic to written form.
- *3.01.08.00 Determine slope midpoint, and distance.
    - 3.01.08.01 Solve problems related to sets of points on a Cartesian coordinate system.
- *3.01.09.00 Model real-world phenomena with polynomial and exponential functions.
    - 3.01.09.01 Use curve fitting to predict from data.

Geometry

(Note: It is appropriate to teach geometry to Tech Prep students with some theorems and proofs, but for maximum student engagement and success, the major focus should be on the more practical aspects of geometry, such as calculating volumes, surfaces, etc.)

- *3.02.01.00 Find perimeters, surface areas and volumes of geometric figures.
  - 3.02.01.01 Recognize and classify two- and three-dimensional figures (e.g., circles, triangles, rectangles, cylinders, prism).
  - 3.02.01.02 Create and interpret drawings of three-dimensional objects.
  - 3.02.01.03 Classify, label, and describe polygons and solids.
  - 3.02.01.04 Represent problem situations with geometric models and apply properties of figures.
  - 3.02.01.05 Use handheld graphic calculators to solve area and volume problems.
  - 3.02.01.06 Given the linear dimensions of various geometric shapes common to the techno-- logical industries, determine areas and volumes in English and metric units.
- *3.02.02.00 Explore compass and straight edge constructions in the context of geometric theorems.
- *3.02.03.00 Recognize, classify, and use properties of lines and angles.
  - 3.02.03.01 Demonstrate an understanding of angles and parallel and perpendicular lines.
  - 3.02.03.02 Define terms related to angles.
  - 3.02.03.03 Make constructions related to angles.
  - 3.02.03.04 Demonstrate an understanding of special angles.
  - 3.02.03.05 Understand the various units of measure of angles.
  - 3.02.03.06 Identify points, lines, and planes.
  - 3.02.03.07 Use the concept of between-ness.
  - 3.02.03.08 Measure angles correctly.

*3.02.04.00 Describe and apply the properties of similar and/or congruent figures.

- 3.02.04.01 Be able to make scale drawings.

*3.02.05.00 Solve right-triangle problems.

- 3.02.05.01 Apply the Pythagorean theorem.
- 3.02.05.02 Identify basic functions of sine, cosine, and tangent
- 3.02.05.03 Compute and solve problems using basic trig functions.

*3.02.06.00 Demonstrate inductive and deductive reasoning through application to various subject areas.

- 3.02.06.01 Demonstrate an understanding of and ability to use proof.

Numbers and Number Relations

*3.03.01.00 Estimate answers, compute, and solve problems involving real numbers.

- 3.03.01.01 Round off decimals to one or more places
- 3.03.01.02 Round and/or truncate numbers to designated place value.
- 3.03.01.03 Round off single and multiple digit whole numbers.
- 3.03.01.04 Estimate measurements.
- 3.03.01.05 Use mental computation when computer and calculator are inappropriate.

*3.03.02.00 Compare and contrast the real number system, the rational number system' and the whole number system.

*3.03.03.00 Determine if a solution to a mathematical problem is reasonable (estimate).

*3.03.04.00 Select and compute using appropriate units of measure.

- 3.03.04.01 Convert, compare, and compute with common units of measurement within and/or across measurement systems.

Data Analysis and Probability

*3.04.01.00 Collect and organize data into tables, charts, and graphs.

    3.04.01.01 Take a random sample from a population.

*3.04.02.00 Determine the probability of an event.

    3.04.02.01 Determine the probability of more than one event.

    3.04.02.02 Use computer simulations and random number generation to estimate probability.

*3.04.03.00 Understand and apply measures of central tendency, variability, and correlation.

    3.04.03.01 Compute and interpret means (averages).

    3.04.03.02 Compute and interpret median and/or mode.

    3.04.03.03 Understand what a normal distribution is.

    3.04.03.04 Understand what a uniform distribution is.

Technical Algebra

*3.05.01.00 Evaluate and graph functions using rectangular coordinates.

    3.05.01.01 Graph inequalities in two variables.

    3.05.01.02 Analyze the effects of parameter changes on graphs.

*3.05.02.00 Solve systems of linear equations and inequalities using matrices, graphs, and algebraic methods.

    3.05.02.01 Solve systems of linear equations with up to three variables.

    3.05.02.02 Solve a 2x2 system of linear equations using matrices.

    3.05.02.03 Describe and solve algebraic situations with matrices.

•3.05.03.00 Understand the complex number system and exhibit facility with its operation.

3.05.03.01 Solve problems having complex solutions.

3.05.03.02 Examine complex numbers as zeros of functions.

3.05.03.03 Graph basic functions using polar coordinate system.

3.05.03.04 Graph using polar coordinates.

3.05.03.05 Contrast and compare algebras of rational, real, and complex numbers with characteristics of a matrix algebra system.

3.05.03.06 Determine factors and roots of a polynomial with complex roots.

3.05.03.07 Graph complex numbers.

3.05.03.08 Add, subtract, multiply and divide complex numbers in rectangular and polar form.

3.05.03.09 Convert complex numbers from rectangular form to the exponential.

•3.05.04.00 Analyze exponential and logarithmic functions.

3.05.04.01 Identify and define inverse functions.

3.05.04.02 Do calculations involving exponential and logarithmic expressions and functions.

3.05.04.03 Use definitions to show the relationship between exponential and logarithmic functions.

3.05.04.04 Graph the logarithmic and exponential functions.

3.05.04.05 Describe and use inverse relationship between functions including exponential and logarithmic.

3.05.04.06 Use graphing calculators to generate tables to plot exponential and logarithmic curves.

3.05.04.07 Use properties of logarithms to solve problems.

3.05.04.08 Use graphing calculators to calculate logarithms in bases other than 10.

3.05.04.09 Solve elementary logarithmic and exponential equations.

*3.05.05.00 Simplify and solve quadratic equations.

3.05.05.01 Simplify algebraic expressions and multiply and divide polynomials along with solving quadratic equations.

3.05.05.02 Solve a quadratic equation by factoring by completing the square, and by using the quadratic formula.

Technical Trigonometry

*3.06.01.00 Solve problems using the trigonometric functions.

3.06.01.01 Know the sign of each circular function in any quadrant.

3.06.01.02 Know the circular functions of the special angles, pi/6, pi/4, pi/3 (30, 60, 90)

3.06.01.03 Define the circular functions on a circle of radius r with the center at the origin.

3.06.01.04 Understand the relationship of the circular functions and the trig functions.

3.06.01.05 Identify and use the trig functions for the sum of angles.

3.06.01.06 Solve right-triangle problems.

3.06.01.07 State the value of the trig functions of an angle using the reference angle.

3.06.01.08 Apply the law of sines to find measures of sides of angles of a triangle.

3.06.01.09 Apply the law of cosines in finding measures of sides and angles of triangles.

3.06.01.10 Convert between radians and degrees.

3.06.01.11 Solve problems with negative rotations.

3.06.01.12 Solve right triangle problems including application problems.

*3.06.02.00 Recognize and identify graphs of the trigonometric functions.

- 3.06.02.01 Recognize and graph basic trig curves.
- 3.06.02.02 Explore graphs in three dimensions.
- 3.06.02.03 Identify and define inverse functions.
- 3.06.02.04 Solve trigonometric equations and verify trigonometric identities.
- 3.06.02.05 Use the fundamental trig identities in performing operations.

*3.06.03.00 Demonstrate an understanding in the use of vectors.

- 3.06.03.01 Apply vectors in problem solutions
- 3.06.03.02 Deduce properties of figures using vectors.
- 3.06.03.03 Develop and use vectors to represent distance and magnitude including operations.
- 3.06.03.04 Explore relationships between complex numbers and vectors.
- 3.06.03.05 Add and subtract vectors geometrically.
- 3.06.03.06 Use graphing calculators in the study of vectors.

SCIENCE LITERACY

Chemistry

*4.01.01.00 Explore atomic theory and present findings using various representational formats.

4.01.01.01 Describe a mechanism of bond formation and identify the type of chemical bond formed as ionic, covalent, or metallic.

4.01.01.02 Relate the concept of periodicity to atomic properties and the periodic table of elements.

4.01.01.03 Describe charge and ionic compounds in the context of electrochemical theories.

4.01.01.04 Recognize that the atomic model is only a model and, like any model, is subject to change.

4.01.01.05 State an atomic theory which includes atomic structure, components and their properties, interactions (electron/nuclear) and theory models.

4.01.01.06 Demonstrate knowledge of chemical symbolism which will include symbols, formulas, and equations.

*4.01.02.00 Perform investigations that require observations over varying periods of time concerning the interrelationship of matter and energy.

4.01.02.01 State a scheme of matter which includes elements, compounds, and mixtures.

4.01.02.02 Relate a chemical equation to the concept of chemical change.

4.01.02.03 Classify matter according to properties and composition.

4.01.02.04 Predict the properties of matter based on data provided in pictures, drawings, charts, graphs, tables, mathematical expressions, and scientific literature.

4.01.02.05 Describe the conservation laws and correctly use the standard units for these laws in relation to conservation of mass/energy and conservation of charge.

4.01.02.06 Describe properties of carbon and organic molecules.

4.01.02.07 State the laws of chemical combinations (conservation of mass, definite composition, multiple proportions).

4.01.02.08 List assumptions of the kinetic theory of matter.

4.01.02.09 Understand chemical changes during combustion, and the relationship between these changes and the carbon cycle, and relationship to the greenhouse effect.

4.01.02.10 Manipulate data in problem solving, including: mole problems, concentration problems, gas law problems, atomic/molecular structure problems and equation balancing.

4.01.02.11 Discuss the concept of mole.

4.01.02.12 State the properties of gases and the laws that apply to gases.

4.01.02.13 Identify applications of Avogadro's hypothesis such as Avogadro's number, molar volume, and gram molecular weight/molar mass.

4.01.02.14 Use the kinetic molecular theory to explain states of matter, rates of reaction, and chemical equilibrium.

4.01.02.15 Describe Stoichiometric relationships

Biology/Ecology

*4.02.01.00 Using models and explorations, examine cellar components and their relationships.

4.02.01.01 Describe the cell theory; structure and function.

4.02.01.02 Describe the role of nucleic acids in cell functions and heredity.

4.02.01.03 Describe the events of mitosis and meiosis.

4.02.01.04 State Mendel's laws of heredity.

4.02.01.05 List causes and effects of gene mutations and chromosomal aberrations.

4.02.01.06 Describe current advances in genetic engineering and possible applications in agriculture and medicine.

*4.02.02.00 Recognizing and contrasting biological characteristics, derive a scheme to classify living organisms.

4.02.02.01 List characteristics of living organisms.

4.02.02.02 Classify common organisms by observable characteristics.

4.02.02.03 Describe how living organisms are classified.

4.02.02.04 List characteristics of organisms in each kingdom.

4.02.02.05 Explain the difference between viruses and bacteria.

*4.02.03.00 Formulate an understanding of the relationship about organisms, their physical surroundings and their change processes.

4.02.03.01 Describe the interrelationship of an organism with its environment, including: pollution, populations, community, conservation, habitat, and ecosystem.

4.02.03.02 Define natural selection and list evidence for its existence.

4.02.03.03 Discuss the development of Darwin's theory of evolution.

4.02.03.04 Discuss hypotheses of the origin of life.

4.02.03.05 Identify ways to take responsibility for living in a global environment

4.02.03.06 Explain and present examples of the importance of water to sustain life in terms of available water sources, water quality, and uses and quantification.

4.02.03.07 Explain interrelationship of wastewater collection, treatment, and public health in terms of organic and inorganic pollutant concentrations and pathogenic organisms.

4.02.03.08 Describe how human activities interfere with biological diversity.

*4.02.04.00 Using an understanding of life processes, formulate explanations of the influences and the effects of other organisms on the living condition.

4.02.04.01 Explain the relationship between microorganisms and disease .

4.02.04.02 Describe the following life processes: digestion, transpiration, respiration, circulation, reproduction, locomotion, excretion, sensory, regulation by endocrine glands, metabolism, and photosynthesis

4.02.04.03 Distinguish between myths and realities of the HIV virus and AIDS.

4.02.04.04 Explain the relationship between anatomical structure and function.

4.02.04.05 Identify structures in human physiology

Physics

*4.03.01.00 Analyze changes within a system when inputs, outputs, and interactions are altered to explain the behavior of charges.

4.03.01.01 Describe electrical energy, including the interaction of matter and energy and energy transformation.

4.03.01.02 Describe the properties of magnetic fields, electrical fields, and electrical charges.

4.03.01.03 Identify and describe basic electrical systems components and theories.

*4.03.02.00 Using measuring and mathematical techniques, apply the laws of motion and conservation to real physical systems.

4.03.02.01 Describe energy transfers and transformations of a system utilizing conservation laws.

4.03.02.02 Describe motion in the context of Newton's Law: linear and rotational.

4.03.02.03 Define work and energy and relate these concepts to kinetic energy, potential energy, and conservation of energy.

4.03.02.04 Define temperature and heat in units commonly used for each.

4.03.02.05 Identify the causes and effects of motion.

4.03.02.06 Use vector analysis (mathematical and graphical) to represent and solve force system problems.

*4.03.03.00 Analyze the heat energy changes within a system as related to the laws of thermodynamics.

  4.03.03.01 State first and second laws of thermodynamics.

  4.03.03.02 Define specific heat capacity and latent heat.

  4.03.03.03 Discuss the concept of entropy.

*4.03.04.00 Using the knowledge gained through experimentation of the characteristics of waves, predict how waves will behave as they interact with each other and various materials.

  4.03.04.01 Describe sound systems, including the interaction of matter and energy and energy transformation.

  4.03.04.02 Identify the general areas of the electromagnet ice spectrum.

  4.03.04.03 Describe reflection and refraction as applied to mirrors and optical instruments (lenses).

  4.03.04.04 Describe the particle and wave theories of light.

Laboratory Safety Procedures

*4.04.01.00 Identify and be able to manipulate lab apparatus and materials safely.

*4.04.02.00 Demonstrate familiarity with lab safety equipment (e.g., eyewash, fire blanket & extinguisher, shower, etc.).

Scientific Process

*4.05.01.00 Using sound experimental designs, formulate hypotheses and models that account for observable events.

  4.05.01.01 Describe the role of observation and experimentation in the development of scientific theories.

  4.05.01.02 Describe the importance of the use of models in scientific thought.

  4.05.01.03 Recognize that scientific models are only representations of phenomena and may in fact be faulty or deficient.

  4.05.01.04 Investigate some of the ethical dilemmas of the scientist.

4.05.01.05 Identify and define a scientific problem.

4.05.01.06 Ask appropriate scientific questions and recognize what is involved in experimental approaches to the solutions of such questions through familiarity with laboratory and field work.

4.05.01.07 Identify problems rooted in science and technology (effects of hazardous materials on health and safety, effects of drugs on health, troubleshooting problems on a machine).

*4.05.02.00 Use sound experimental designs and models to test hypotheses.

4.05.02.01 Distinguish among fact, hypothesis, and opinion; the relevant from the irrelevant; and the model from the observations the model was derived to describe.

4.05.02.02 Check the logical consistency of hypothesis with relevant laws, facts, observations, or experiments.

4.05.02.03 Read scientific materials critically.

4.05.02.04 Gather scientific information through library work.

4.05.02.05 Investigate areas of specialization in science.

4.05.02.06 Apply basic scientific/technical solutions to selected problems.

4.05.02.07 Employ scientific laws and principles in familiar or unfamiliar situations.

4.05.02.08 Make predictions from data using concepts, laws, and theories.

4.05.02.09 Use facts, concepts, laws, and theories to explain phenomena.

4.05.02.10 Predict the effects of changing variables in a given situation.

4.05.02.11 Suggest or recognize a scientific hypothesis.

4.05.02.12 Construct a hypothetical model.

4.05.02.13 Make direct measurements using laboratory apparatus.

4.05.02.14 Design, conduct, and evaluate an experiment.

4.05.02.15 Use sampling techniques.

4.05.02.16 Propose or select validating procedures (both logical and empirical).

4.05.02.17 Analyze experimental designs.

4.05.02.18 Demonstrate concern for issues related to measurement (e.g., reliability and validity).

*4.05.03.00 Using observations derived from experimental data, draw conclusions or make inferences.

4.05.03.01 Interpret data; i.e., comprehend the meaning of data and recognize, formulate, and evaluate conclusions and generalizations on the basis of information known or given.

4.05.03.02 Interpret information presented in pictures, drawings, charts, graphs, mathematical expressions, and scientific literature.

4.05.03.03 Reason quantitatively and symbolically.

4.05.03.04 Interpret observations of experiments and analyze these to determine patterns, state inferences, and/or draw conclusions.

4.05.03.05 Interpret experimental observations using facts, concepts, laws, and theories.

*4.05.04.00 Organize and communicate the results obtained by observation and experimentation.

4.05.04.01 Sequence events according to the order of occurrence.

4.05.04.02 Describe ways scientists communicate their results.

4.05.04.03 Demonstrate the ability to summarize empirical findings clearly and concisely in written form.

SOCIAL/CULTURAL LITERACY

Growth of Social Political, and Economic Institutions

- *5.01.01.00 Describe the role of individuals within their political system, process of voter registration, the election process and responsibility and privileges of citizenship and how law protects individuals.
- *5.01.02.00 Explain reasons for European settlement in the New World, the development of divergent political ideology and development of a new nation.
- *5.01.03.00 Examine important historical documents in context with the American experience including socio-political and ideological influences that shaped their design. (NW Ordinance, Declaration of Independence, Bill of Rights, and Constitution)
  - 5.01.03.01 Explain the purpose and contents of the Bill of Rights.
  - 5.01.03.02 Demonstrate an understanding of federalism (local, state, national).
  - 5.01.03.03 Identify the main function of each branch (legislative, executive, judicial) at different levels.
  - 5.01.03.04 Describe the process for making, amending or removing laws.
  - 5.01.03.05 Identify representative symbols: flag, national anthem, Pledge of Allegiance, Independence Day, etc.
- *5.01.04.00 Describe the political process.
  - 5.01.04.01 Understand the role of political parties in a democracy.
  - 5.01.04.02 Understand the role of public officials and how policy is carried out.
  - 5.01.04.03 Describe strengths and weaknesses of the American System.
  - 5.01.04.04 Describe how resources are gathered to support the process and policies.
- *5.01.05.00 Compare and contrast political systems.
  - 5.01.05.01 Distinguish characteristics and essential features of representative democracy, monarchy, and dictatorships.

5.01.05.02 Identify international governing bodies (e.g., United Nations, League of Nations, World Bank, European Economic Community, Organization of American States, etc.) and their impact.

*5.01.06.00 Compare the culture, customs, and traditions of different ethnic and minority groups in America.

5.01.06.01 Be aware of the diverse social, psychological, political, and economic factors which influence lifestyles.

5.01.06.02 Evaluate methods and procedures applied by individuals, groups and social agencies to overcome social and economic barriers.

5.01.06.03 Determine the role of, and conflict between, American values such as order, freedom, equality and individualism as they operate in the American Political System.

5.01.06.04 Assess the impact of social class and social structure on economic development in specific countries in the First World and in the Third World.

*5.01.07.00 Know that individuals and societies make choices to satisfy wants with limited resources.

5.01.07.01 Develop an understanding of economic systems.

5.01.07.02 Develop an understanding of the structure and functions of the American economy.

5.01.07.03 Recognize the uneven distribution of world resources.

5.01.07.04 Describe the role of technological growth in economic development and the impact of technology on the physical and human environment.

Human Diversity and Historical/Current Issues

*5.02.01.00 Describe the causes and effects of selected wars.

*5.02.02.00 Describe the diversity of populations encompassing the Civil Rights movement, racism, ethnocentrism, and minority group movements.

5.02.02.01 Recognize diversity among significant individuals

5.02.02.02 Recognize diversity among significant organizations

5.02.02.03 Recognize diversity surrounding immigration

5.02.02.04 Recognize diverse ethnic and minority groups

5.02.02.05 Recognize major world religions

5.02.02.06 Describe the relationship between diversity and historical development and contributions

*5.02.03.00 Describe how an individual interacts with the various societal, economic, and political systems.

5.02.03.01 Be aware of the diverse social, psychological, political and economic factors which influence lifestyles.

5.02.03.02 Recognize individuals and societal practices which result in exceptional treatment of people from various backgrounds.

5.02.03.03 Identify and define the basic concepts of community and community development, and the role of individuals within their political systems and opportunities for civic involvement.

5.02.03.04 Describe and discuss contemporary domestic and international political issues and events, and evaluate the way they impact on self and society.

5.02.03.05 Identify and discuss career opportunities.

Analyzing Information

*5.03.01.00 Differentiate between primary and secondary sources of information.

*5.03.02.00 Illustrate that information can be influenced by cultural bias or propaganda.

*5.03.03.00 Analyze and explain social, cultural and political problems and suggest remedies to those problems.

*5.03.04.00 Compare and contrast culture, customs and traditions of ethnic and minority groups.

*5.03.05.00 Analyze social forces that influence family life.

*5.03.06.00 Demonstrate the ability to use information that enables citizens to make informed choices.

*5.03.07.00	Communicate and cooperate with people of different cultural backgrounds.
*5.03.08.00	Collect and analyze information from charts, graphs, maps, and pictures.
*5.03.09.00	Identify and explain how world problems and future trends will impact his or her life.
*5.03.10.00	Describe and discuss world patterns of population, geographic landforms, climate regions, and economic activities.
*5.03.11.00	Identify opportunities for involvement in civic activities.

TECHNOLOGY LITERACY

Impact of Technology

*6.01.01.00 Develop an awareness of the need and function of technology in society.

    6.01.01.01 Explore cause and effect linkages between technology and the environment.

    6.01.01.02 Explain how technological change can affect all technology.

    6.01.01.03 Evaluate the impact of technology on people, the environment, culture, the economy, and community.

    6.01.01.04 Explain how business and industry are related to the larger context of technology, industry, and society.

    6.01.01.05 Describe the way in which technological systems have affected social changes and patterns in our society.

    6.01.01.06 Explore how people use technology to solve problems.

*6.01.02.00 Develop an awareness of the significance of technology in the past, present, and future.

*6.01.03.00 Explain the interrelationships between business, industry, and society.

    6.01.03.01 Evaluate the impact of infrastructure deterioration on people, the environment, and the economy.

*6.01.04.00 Analyze the role of ethics in technological decision making.

    6.01.04.01 Research the social effects of technology and identify ethical implications that develop.

    6.01.04.02 Recognize that all technological endeavors yield positive and negative side effects.

    6.01.04.03 Describe the impact of government on the use of technology.

    6.01.04.04 Describe copyright laws and issues as they apply to software.

    6.01.04.05 Describe security/privacy issues related to the use of computers.

*6.01.05.00 Explain the interrelationship between business, industry, and community.

Technology in the Workplace

*6.02.01.00 Describe the importance of product quality control.

6.02.01.01 Participate in project-oriented quality control exercises.

*6.02.02.00 Describe the importance of the quality control process.

6.02.02.01 Explain how improved quality leads to improved productivity, competitive position, and profitability.

6.02.02.02 Define the principles of team management.

6.02.02.03 Describe the importance of statistical process control.

6.02.02.04 Plan team meetings.

6.02.02.05 Cite examples of companies that have benefitted from quality efforts.

*6.02.03.00 Solve problems utilizing a systems approach.

6.02.03.01 Apply brainstorming as a method for generating ideas.

6.02.03.02 Apply cause and effect analysis.

6.02.03.03 Evaluate results and make modification to improve a solution.

6.02.03.04 Compile and analyze experimental or design data.

6.02.03.05 Seek new knowledge, synthesize this information, and formulate it into a report or use it in solving a defined problem.

6.02.03.06 Use a research and development process common to industry to solve problems (integrating a variety of productivity analysis skills).

6.02.03.07 Learn how to reach a group consensus.

6.02.03.08 Distinguish between open and closed loop systems.

*6.02.04.00 Define productivity and its relationship to management concepts.

- 6.02.04.01 Develop an action plan that details what, when, and by whom, action will be taken for performance improvement.
- 6.02.04.02 Demonstrate the ability to apply management and planning tools such as flow charts, check sheets, cause and effect diagrams, control charts, etc.
- 6.02.04.03 Describe and use the Plan-Do-Check-Act process.
- 6.02.04.04 Describe input, process, output systems.

*6.02.05.00 Given an industry or a company, identify "customers."

*6.02.06.00 Develop the ability to function as a member of small or large groups.

- 6.02.06.01 Learn how to reach a group consensus.
- 6.02.06.02 Participate in at least one decision-making responsibility role of a hypothetical enterprise.
- 6.02.06.03 Demonstrate effective negotiation skills.
- 6.02.06.04 Demonstrate effective delegation skills.
- 6.02.06.05 Describe the purpose of unions.

*6.02.07.00 Describe the free enterprise system.

- 6.02.07.01 Describe a simplified version of a patent application process to ensure protection of ideas and control of disclosure.

Technological Tools and Techniques

*6.03.01.00 Describe basic computer operations.

*6.03.02.00 Operate computer hardware.

- 6.03.02.01 Demonstrate keyboarding proficiency.
- 6.03.02.02 Demonstrate the ability to utilize various peripherals.
- 6.03.02.03 Access information networks of a variety of types.

6.03.02.04 Identify and describe the function of the major hardware components comprising a personal computer.

*6.03.03.00 Utilize a variety of software.

6.03.03.01 Prepare reports, resumes, or memoranda using a word processing package.

6.03.03.02 Describe what a database is and what it is used for.

6.03.03.03 Demonstrate general knowledge of CAD and CAM technologies.

6.03.03.04 Describe the major types and applications of software.

6.03.03.05 Determine the availability of resources through information networks.

6.03.03.06 Operate desktop publishing systems.

6.03.03.07 Access external computers using a modem.

6.03.03.08 Utilize information management systems.

6.03.03.09 Utilize a spreadsheet package.

6.03.03.10 Apply basic commands to format disks, copy files, create directories, delete files, change default drives, and access software packages for a variety of computer systems.

*6.03.04.00 Use basic technological language accurately across a variety of technologies.

6.03.04.01 Demonstrate familiarity with different types of language forms used in various technologies, i.e., graphic, symbolic, and verbal.

6.03.04.02 Recognize that different technologies use jargon specific to those technologies.

6.03.04.03 Describe the resources necessary for technology resource people: i.e., information, materials, tools/machines, capital, energy, and time.

*6.03.05.00 Visualize and describe two- and three-dimensional space.

6.03.05.01 Demonstrate familiarity with the basic types of engineering drawings.

6.03.05.02 Illustrate and/or describe 3-D objects from different points of view (front, back, side, etc.)

6.03.05.03 Develop a three-dimensional mental and physical representation of an object from a two-dimensional drawing.

6.03.05.04 Visualize and present product ideas

*6.03.06.00 Utilize two- and three-dimensional drawings.

6.03.06.01 Represent a three-dimensional object in a two-dimensional drawing.

6.03.06.02 Refine and communicate project ideas.

*6.03.07.00 Create a three-dimensional drawing.

*6.03.08.00 Develop responsible attitudes toward safety around technology.

6.03.08.01 Demonstrate the safe and correct handling of hazardous materials and processes.

6.03.08.02 Demonstrate proper use of common hand and power tools.

*6.03.09.00 Use measuring devices.

6.03.09.01 Perform linear measuring procedures.

6.03.09.02 Perform volume measuring procedures.

6.03.09.03 Demonstrate the accurate use of architectural and engineering scales.

6.03.09.04 Perform temperature measuring procedures.

*6.03.10.00 Demonstrate factors affecting the selection and use of material resources.

6.03.10.01 Explore the utilization of tools and materials in engineering applications.

6.03.10.02 Describe the major properties of materials.

6.03.10.03 Safely perform some common secondary materials processing activities (e.g., drilling, milling, turning, and grinding).

*6.03.11.00 Choose appropriate resources.

- 6.03.11.01 Perform selected tests to determine materials properties and appropriateness for various uses.

*6.03.12.00 Use multimedia equipment.

- 6.03.12.01 Create multimedia presentations.

*6.03.13.00 Demonstrate an understanding of the roles and importance of electronics in contemporary technology

- 6.03.13.01 Describe what is meant by electronics technology.
- 6.03.13.02 List where electronics technology is used.
- 6.03.13.03 Describe why electronics technology is used.

HEART of OHIO TECH PREP CONSORTIUM
1996

Construction Technologies Model

PART III:
Tech Prep Secondary Competencies (Leveled)

(Pickerington High School)

TECH PREP LAB COMPETENCIES
CONSTRUCTION TECHNOLOGY

UNIT 1: ARCH 111 CONSTRUCTION BASIC DRAFTING

Competency 111.1.1 Correctly setup and use manual drafting tools to produce a quality drawing. M11,R12

Competency Builders:

111.1.1.1 Clean, maintain and adjust the parallel bar or drafting machine.

111.1.1.2 Lay down and align a sheet of drafting vellum on the work surface ready for drafting.

111.1.1.3 Use a sand pad for sharpening lead compass points and/or a pencil pointer for sharpening lead holder points.

111.1.1.4 List the various hardness of graphite leads and corresponding numbers.

111.1.1.5 Use the Ames Lettering Guide to produce guidelines for consistent free-hand letter heights.

111.1.1.6 Maintain and use the compass to produce circular curves and ellipses.

111.1.1.7 Maintain lead holders and utilize the proper rotational method to maintain a conical point when drawing lines.

111.1.1.8 Identify the units on an Architect's scale and use the scale to lay out dimensions on a drawing.

111.1.1.9 Identify the units on an Engineer's scale and use the scale to lay out dimensions on a drawing.

Competency 111.1.2 Develop basic sheet elements and draw simple geometric constructions. M11,R12

Competency Builders:

111.1.2.1 Pre-plan a sheet for optimum placement of drawings and for space usage on the sheet.

111.1.2.2 Develop borders and title blocks.

111.1.2.3 Draw lines at 15° increments radiating from a central point using a combination the 45° and the 30° - 60° triangles.

111.1.2.4 Use circle templates, and irregular or adjustable curves to produce arcs, spirals and irregular lines.

111.1.2.5 Construct geometric shapes including, circles, polygons and non-regular shapes.

Competency 111.1.3 Develop a consistent free-hand lettering style. M11,R12

Competency Builders:

111.1.3.1 Apply the appropriate lettering sizes to dimensions, notes, sub-titles and titles.

Competency 111.1.4 Use the current industry standard method of dimensioning and referencing drawings. M11,R12

Competency Builders:

111.1.4.1 Use datum elevation bullets for height notations on elevations and sections.

111.1.4.2 Apply the correct scale to various types of drawings; i.e., site plans, floor plans, elevations and section cuts.

111.1.4.3 Use various line weights (widths) and order of importance to differentiate between the object and other elements such as centerlines, dimensions, hidden features and property lines.

111.1.4.4 Use various line weights (widths) to convey the illusion of depth, distance or separation.

111.1.4.5 Use common architectural dimensioning system including continuous dimension strings.

Competency 111.1.5 **Explain and illustrate the relationships of views in orthographic projection.** **M11,R12**

Competency Builders:

111.1.5.1 Develop two dimensional (orthographic views) from three dimensional object, including straight, curved surfaces, and oblique surfaces.

111.1.5.2 Generate auxiliary views of oblique surfaces to develop true size and shapes of planes.

111.1.5.3 Reproduce a simple floor plan at an appropriate scale using proper line weights to identify full height and lesser walls, built-in items, and fixtures.

111.1.5.4 Use the appropriate symbols, linework and poche to indicate walls, doors, windows, hidden overhead elements, and materials of construction.

111.1.5.5 Develop exterior building elevations from floor plans and section cuts.

111.1.5.6 Use simple material symbols to indicate exterior materials of construction.

111.1.5.7 Use a simple building section (outline) to develop exterior elevations.

Competency 111.1.6 **Use the appropriate scale, measurement systems and symbols to develop site plans including cadastral (legal property information) and site plan information and topographic (physical objects) information.** **M11,R12**

Competency 111.1.7 **Use electrical symbols and HVAC symbols to develop electrical and mechanical drawings.** **M11,R12**

Competency 111.1.8 **Make simple blueline diazzo print copies of original manuscripts.** **M11,R12**

UNIT 2:ARCH 112 CONSTRUCTION CAD DRAFTING

Competency 112.2.1 **Describe the inter-relationship of computer hardware and software comprising a CAD Drafting system.** **I11,M12**

Competency Builders:

112.2.1.1 List and describe the hardware components necessary to support CAD Drafting system.

112.2.1.2 Describe the inter-relationship of the software comprising the CAD Drafting system and differentiate between the operating system and the applications software.

112.2.1.3 Use the operating system to format storage devices (diskettes) to save files and to enter and exit the CAD application program; be familiar with the file utility commands for creating a new drawing, opening an existing file and ending a drawing session.

112.2.1.4 Identify the various components depicted on the graphics screen, i.e. pull down mens, icons, and dialogue boxes; use the mouse (puck) to pick, enter (accept), and cancel from the screen or tablet.

112.2.1.5 Use the function keys to control graphic screen actions.

Competency 112.2.2 **Describe the function of and use the drawing commands to set up and create a drawing.** **I11,M12**

Competency Builders:

112.2.2.1 Describe and use the drawing units commands involving unit settings, layers, scaling and line types to create a proto-type drawing.

112.2.2.2 Describe and use the drawing commands involving lines polylines, circles arcs, ellipses and regular polygon shapes to create borders on a proto-type drawing.
Competency Builders:

Competency 112.2.3 **Describe the function of and use editing commands to modify and accelerate the drawing process.** **I11,M12**

Competency Builders:

112.2.3.1 Describe and use the editing commands to zoom, pan, oops, redraw/regenerate undo, erase, redo and set the view resolution to create and edit drawings.

112.2.3.2 Describe and use the editing commands to offset, trim and extend lines and to create fillets at the intersection of lines..

112.2.3.3 Describe and use the editing commands involving moving, copying, scaling, rotating, breaking and stretching to modify the drawing; use the array and mirroring command to accelerate the drawing process. Produce an architectural floor plan and two elevations of a small office building.

112.2.3.4 Describe and use the editing commands involving dividing, exploding and measuring lines.

Competency 112.2.4 **Describe and use the object snaps, selection settings and precision inputs to control the drawing process. I11, M12**

Competency 112.2.5 **Describe and use the inquiry commands to check the drawing.**
I11, M12

Competency 112.2.6 **Describe and use the text commands to create text styles, set text size, annotate and correctly place text in the drawing.**
I11,M12

Competency 112.2.7 **Describe and use dimensioning command to establish dimension accuracy, settings and positioning of dimensions on the architectural floor plan of a small office building.**
I11,M12

Competency 112.2.8 **Describe the function of and use of block command to create a library of commonly used elements. I11, M12**

Competency Builders:

112.2.8.1 Describe and use the block commands to create an architectural library of elements in building construction; i.e., windows, doors, plumbing fixtures and furniture. Correctly place the blocks in the architectural floor plan of a small office building.

112.2.8.2 Create a site plan using surveying units. Use the block commands to create library of site elements. Using the floor plan, create and insert the roof plan of the small office building as a block into the site plan.

Competency 112.2.9 **Use the plot command to plot the site drawing and architectural plan/elevation sheet. I11, M12**

UNIT 3: CIVIL 120 BASIC CONSTRUCTION MATERIALS
(Formerly ARCH 120)

Competency 120.3.1	**Perform basic area, volumetric, strength and density calculations.**	**M11,R12**

Competency Builders:

120.3.1.1 Perform mass, volume, specific weight and specific gravity calculations.

120.3.1.2 Perform force, area, stress and strength calculations.

Competency 120.3.2	**Use industry standard references and specifications to determine material acceptability.**	**M11,R12**

Competency Builders:

120.3.2.1 Describe quality control and quality assurance in by conformance to industry codes, specifications, standards and formats.

120.3.2.2 Differentiate amongst industry codes, specifications, standards and formats and cite applicable examples.

Competency 120.3.3	**Perform basic soils analyses.**	**M11,R12**

Competency Builders:

120.3.3.1 Describe soil particles by grain size in accordance with American Association of State Highway Transportation Officials (AASHTO) standards.

120.3.3.2 Determine the moisture content of a soil sample in accordance with American Society of Testing Materials , ASTM D-2216 or ASTM D-4643.

120.3.3.3 Determine Soil Particle Size by Sieve Analysis in accordance with ASTM D-442.

120.3.3.4 Describe the procedure for performing soil compaction test by Proctor Method in accordance with ASTM D-698 and ASTM D-1557.

120.3.3.5 Differentiate between the procedures for Standard and Modified Proctor Tests.

Competency 120.3.4 Describe the manufacture and list the basic test applicable to bituminous (flexible) pavement. **M11,R12**

Competency Builders:

120.3.4.1 Describe the process in the manufacture and placement of bituminous (flexible) pavement.

120.3.4.2 List the tests and inspection procedures in the manufacture and placement of bituminous (flexible) pavement.

120.3.4.3 Describe the structure (base, intermediate and wearing coarses) of various types of bituminous (flexible) pavement systems including applications.

Competency 120.3.5 Perform basic Portland Cement Concrete tests. **M11,R12**

Competency Builders:

120.3.5.1 Properly prepare, weigh and mix the ingredients for Portland Cement Concrete.

120.3.5.2 Describe the proper procedure for sampling freshly-mixed concrete in accordance with ASTM C-172.

120.3.5.3 Obtain temperature of freshly-mixed Portland Cement Concrete in accordance with ASTM C-1064.

120.3.5.4 Perform the Slump Test of Portland Cement Concrete in accordance with ASTM C-143.

120.3.5.5 Describe the proper procedure for determining the Air Content of freshly-mixed Portland Cement Concrete by Pressure Method in accordance with ASTM C-231.

120.3.5.6 Perform the correct procedure for Casting and Curing Portland Cement Concrete Test Specimens in the Field in accordance with ASTM C-31.

120.3.5.7 Perform the correct procedure for determining the Compressive Strength of Cylindrical Concrete Specimens in accordance with ASTM C-39.

120.3.5.8 List three (3) methods including corresponding ASTM specification number of testing the strength of "in place" concrete.

Competency 120.3.6 Describe the manufacture, perform basic testing and build simple structures of masonry products. M11,R12

Competency Builders:

120.3.6.1 Describe the major operations in the manufacture of brick.

120.3.6.2 Describe the major operations in the manufacture of concrete masonry units (CMU's)

120.3.6.3 Properly prepare, weigh and mix the ingredients for Portland Cement Mortar in accordance with ASTI C-150.

120.3.6.4 Construct a small masonry wall.

120.3.6.5 Describe the correct procedure for testing Concrete Masonry Units in accordance with ASTI C-140 for conformance with ASTI C-90.

120.3.6.6 Describe the correct procedure for Sampling and Testing Brick and Structural Clay Tile in accordance with ASTI C-67 and ASTI C-216.

Competency 120.3.7 List the materials, describe the properties, applications and testing of metals in Division 0500 for the Construction Specification Institute format. M11,R12

Competency Builders:

120.3.7.1 List the metals, each metal's application and resistance to corrosion..

120.3.7.2 Describe the typical metals test for strength.

120.3.7.3 Identify the critical points, corresponding stress and strain and the ranges on a stress/strain curve.

120.3.7.4 Given the characteristic shapes of specific stress/strain curves; identify the specific metal.

120.3.7.5 Given American Institute of Steel Construction (AISC) standards designations for rolled sections, identify the specific shape, by picture/graphic, and where applicable list the section's name and weight per lineal foot.

120.3.7.6 List the major methods of joining steel sections.

120.3.7.7 By ASTI designation, list the various alloys of structural steel and corresponding properties.

120.3.7.8 Differentiate between the chemical composition and associated properties of cast iron and steel.

Competency 120.3.8 List the general classifications and grades and applications, describe defects, perform basic strength tests and construct a simple structure of wood products. M11,R12

Competency Builders:

120.3.8.1 Differentiate between softwoods and hardwoods.

120.3.8.2 Describe the possible defects in wood.

120.3.8.3 In accordance with U.S. Department of Commerce Product Standard PS 20 list the various grade of softwoods and give specific examples.

120.3.8.4 Rough frame a wall having at least one (1) opening or penetration.

120.3.8.5 List the various types of manufactured wood (i.e. plywood, oriented strand board, etc.) in accordance with American Plywood Association (APA) Standards and cite examples.

120.3.8.6 In accordance with American Plywood Association (APA) Standards, describe the grades and ratings applicable to manufactured wood systems.

UNIT 4: CMGT 121 BUILDING CONSTRUCTION DRAWINGS
(Formerly ARCH 121)

Competency 121.6.1 Define the purpose, components and organization of construction documents. M11,R12

Competency Builders:

121.6.1.1 List the two (2) major components of construction documents; i.e., drawings and specifications.

121.6.1.2 List the eleven (11) general sections of the specifications.

121.6.1.3 List by number and corresponding name the seventeen (17) divisions (including Division 0) within the body of the specifications as defined by Construction Specification Institute (CHI) format.

121.6.1.4 Explain the purpose of an Addenda.

121.6.1.5 Explain the purpose of a Change Order.

121.6.1.6 List the general organization of the drawings.

121.6.1.7 Identify the various materials used in the drawings by symbol and corresponding name.

Competency 121.6.2 Obtain dimensions from the drawings and perform area and volume calculations. M11,R12

Competency Builders:

121.6.2.1 Identify the units on an engineer's scale.

121.6.2.2 Use the engineer's scale to determine dimensions on the drawings.

121.6.2.3 Identify the units on an architect's scale.

121.6.2.4 Use the architect's scale to determine dimensions on the drawings.

121.6.2.5 Perform linear, area and volume calculations.

Competency 121.6.3 Correlate (Cross-Reference) between items found on the drawings, listed in the specifications and described in manufacturer's data (Sweets Catalogues). M11,R12

Competency 121.6.4 List the major information items found on the Site Plan. M11,R12

Competency Builders:

121.6.4.1 Given the site plan for a commercial building, locate and list the legal (property boundary) information and the topographic (natural and man-made physical) information.

Competency 121.6.5 List the major information items found on the Foundation Drawings. M11,R12

Competency Builders:

121.6.5.1 Given the foundation plan for a commercial building, classify the type of foundation and list the major components comprising the foundation system including materials..

121.6.5.2 Correlate the soils information to the site plan and foundation plan.

Competency 121.6.6 Relate floor plans, exterior elevations, partial elevations and wall sections. M11,R12

Competency Builders:

121.6.6.1 List the major information items found on the floor plans.

121.6.6.2 Given the floor plan for a commercial building, prepare a list of room names and numbers, interior dimensions, materials of construction and size and types of wall penetrations.

121.6.6.3 List the major information items found on the exterior elevations.

121.6.6.4 Given the drawings for a commercial building, prepare a list of the exterior materials, size and types of exterior wall penetrations and vertical dimensions to key building elements.

121.6.6.5 List the major information items found on the wall sections.

121.6.6.6 Explain the drawing reference system used to relate floor plans to wall sections.

121.6.6.7 Given the drawings for a commercial building, cite three (3) examples of the way floor plan cuts relate to wall sections.

121.6.6.8 Given the wall sections for a commercial building, list the materials of construction and corresponding wall thicknesses.

121.6.6.9 Explain the relationship of interior elevations and room finish, door and window schedules and reflected ceiling plans.

Competency 121.6.7 Locate and list the major information items found on the structural drawings. M11,R12

Competency Builders:

121.6.7.1 Given the structural drawings for a commercial building, prepare a list of the major structural shapes, materials of construction and corresponding names.

Competency 121.6.8 List the major information items found on the Mechanical (HVAC) Drawings. M11,R12

Competency 121.6.9 List the major information items found on the Plumbing Drawings. M11,R12

Competency Builders:

121.6.9.1 Given the Plumbing Drawings for a commercial building, identify plumbing symbols by symbol and corresponding name.

121.6.9.2 Explain the basic differences between Plumbing Drawings (schematic & isometric)) and architectural drawings (true planimetric).

Competency 121.6.10 List the major information items found on the Electrical Drawings. M11,R12

Competency Builders:

121.6.10.1 Given the Electrical Drawings for a commercial building, identify electrical symbols by symbol and corresponding name.

121.6.10.2 Explain the basic differences between electrical drawings (schematic) and architectural drawings (true planimetric).

UNIT 5: CMGT 105 CONSTRUCTION CONTRACT DOCUMENTS

Competency 105.7.1 Explain the necessity and develop the ability to clearly communicate via spoken and written word. I11, M12

Competency Builders:

105.7.1.1 Prepare verbal and written communications such as requests for information (RFI's), addenda and change orders.

105.7.1.2 Explain the benefits of resolving contractual differences through partnering versus litigation.

Competency 105.7.2 List, describe and correlate amongst the various documents used in the construction industry. I11, M12

Competency Builders:

105.7.2.1 Compare the similarities and contrast the differences amongst various types of specification manuals.

105.7.2.2 List the various types of forms and documents which comprise a complete set of contract documents.

105.7.2.3 Correlate between specific documents and the phase in the construction sequence in which each is used.

Competency 105.7.3 List and discuss construction bidding procedures and related documents.

I11, M12

Competency Builders:

105.7.3.1 Compare the similarities and contrast the differences amongst the selection process for design professionals, construction managers and design-builder.

105.7.3.2 Compare the similarities and contrast the differences amongst design professional agreements, construction management agreements and design-build agreements.

105.7.3.3 Examine and differentiate the pros and cons of competitive-bid versus negotiated bid packages.

105.7.3.4 Describe and identify the main points of the Ohio Bidding Law of 1988 as pertains to public works projects.

105.7.3.5 Compare the similarities and contrast the differences between public advertisements and invitations to bid.

Competency 105.7.4 List the types, describe the function and outline the differences of the various bid submittal documentsI11, M12

Competency Builders:

105.7.4.1 List the significant information that must be included in a lump sum and in a unit price proposal form.

105.7.4.2 Identify and list the significant information pertinent to bid bonds that is required of a general contractor and a sub-contractor.

105.7.4.3 Examine and summarize quotation requests received by general contractors from sub-contractors.

Competency 105.7.5 List the types, describe the function and outline the differences of the various types of agreements. I11, M12

Competency Builders:

105.7.5.1 List the four (4) conditions which must be fulfilled to constitute a valid contract.

105.7.5.2 Compare the similarities and contrast the differences amongst the standard contract forms used in the construction industry.

105.7.5.3 Based on the strengths and weaknesses of each, determine under which set of conditions when a lump sum, unit price or cost-plus fixed fee contract is most effectively used by the owner and the contractor.

Competency 105.7.6 Describe the major points of performance bonds and payment bonds. I11, M12

Competency Builders:

105.7.6.1 List the necessary qualifications a contractor needs to secure bonding.

Competency 105.7.7 List the methods and discuss the use and applications of performance tracking devices used as supporting documents to the construction agreement. I11, M12

Competency Builders:

105.7.7.1 Describe the use of bar charts, critical path method (CPM), and precedence diagramming method (PDM) in predicting and tracking progress on construction progress.

105.7.7.2 Correlate the effectiveness of bar charts, CPM's and PDM's to specific types of projects.

Competency 105.7.8 Describe the contractual relationship of the owner, contractor and subcontractors. I11, M12

Competency 105.7.9 List and describe the major points of the General Conditions of a set of Contract Documents. I11, M12

Competency Builders:

105.7.9.1 Describe the relationship of the Supplemental Conditions to the General Conditions of a set of Contract Documents.

105.7.9.2 Identify important government provisions in Governmental Supplemental Conditions.

Competency 105.7.10 Discuss the inter-relationship of drawings and specifications and outline specification organization I11, M12

Competency Builders:

105.7.10.1 Compare the relationship of the drawings to the specifications.

105.7.10.2 Explain the important parts (components) of specification formatting.

105.7.10.3 Summarize the importance of using standardized specification language and how it best benefits the construction team.

105.7.10.4 Correlate the seventeen (17) Construction Specification Institute (CSI) headings (including Division 0) with trade organizations in the construction industry.

105.7.10.5 Examine a specification manual and respond correctly to a set of questions within a prescribed timetable as required in a real job setting.

UNIT 6: CMGT 112 CONSTRUCTION INDUSTRY SURVEY

Competency 101.0.1 Describe the various construction industry phases, disciplines and their inter-relationships. I11,M12

Competency Builders:

101.0.1.1 List the various disciplines working in the construction industry and produce a diagram illustrating their inter-relationships.

101.0.1.2 List the traditional phases of the construction process; i.e., planning, design, construction and operations.

Competency 101.0.2 Differentiate between private development and public works projects by funding sources and general length of project. I11,M12

Competency Builders:

101.0.2.1 List three (3) major types of private development; give one example of each.

101.0.2.2 List two (2) major types of public works projects; i.e., building and heavy construction. Give three (3) examples of each.

Competency 101.0.3 Identify four (4) major challenges (potential problems) in each phase of the construction industry; cite a local or regional example of each. I11, M12

Competency 101.0.4 List and differentiate amongst the various trades and professional organizations in the construction industry. I11,M12

Competency Builders:

101.0.4.1 Differentiate between union and open shop contractors.

101.0.4.2 List the services provided by a union.

101.0.4.3 List three (3) contractor organizations and two (2) services provided by each.

Competency 101.0.5 Substantiate the need for life-long learning (continuing education). List six (6) methods of life-long learning. I11,M12

Competency Builders:

101.0.5.1 List at least one professional organization for each of the professions engaged in the construction industry; i.e., architecture, civil engineering, landscape architecture, construction management and surveying.

101.0.5.2 List one serial publication for each of the professions engaged in the construction industry; i.e., architecture, civil engineering, landscape architecture, construction management and surveying.

Competency 101.0.6 Discuss the need for professional registration and technical certification; differentiate between professional registration and technical certification. I11,M12

Competency Builders:

101.0.6.1 List the disciplines within the construction industry which require professional (State of Ohio) registration and list the requirements to attain professional registration in each discipline.

101.0.6.2 List three (3) examples of industry or local certifications required of technicians working in Central Ohio.

Competency 101.0.7 Visit and complete a field trip report on a company or local governmental agency engaged in the construction industry. I11, M12

Competency Builders:

101.0.7.1 Develop an employment description for a technician's position in civil engineering including responsibilities and compensation.

Competency	101.0.8	Identify three (3) types of project management and list one of the strengths and weaknesses of each.	I11, M12
Competency	101.0.9	Identify three (3) non-traditional types of workers entering the construction industry and list one (1) of their special needs or entry barriers into the industry.	I11,M12
Competency	101.0.10	Identify five (5) regulatory agencies exercising authority in the construction industry.	I11,M12

Pickerington High School

Construction Technology

Occupational Competency Analysis Profile
Safety

UNIT 1: Basic Tools, Materials, and Equipment Safety Procedures

Competency 1.1: Identify basic hand tools M11,R12

Competency Builders:

1.1.1 Identify required tools
1.1.2 Identify different brands and quality ranges of tools
1.1.3 Review tool maintenance and warranty information

Competency 1.2 Use personal safety equipment in accordance with current Occupational Safety and Health Administration (OSHA) standards M11,R12

Competency Builders:

1.2.1 Identify OSHA standards concerning the use of personal safety equipment
1.2.2 Identify the consequences of ignoring safety rules
1.2.3 Wear hard-toed shoes
1.2.4 Wear hard hat
1.2.5 Wear job-appropriate eye protection
1.2.6 Wear job-appropriate hearing protection
1.2.7 Wear job-appropriate respiratory protection
1.2.8 Wear job-appropriate hand protection
1.2.9 Wear job-appropriate clothing
1.2.10 Avoid loose-fitting, unbuttoned, or frayed clothing
1.2.11 Secure long hair and remove jewelry

Competency 1.3 Use safety and fire equipment M11,R12

Competency Builders:

1.3.1 Conduct routine inspections of safety and fire equipment
1.3.2 Use safety apparatus and equipment in accordance with job requirements and safety standards
1.3.3 Check power sources for potential safety problems
1.3.4 Shut down power in dangerous situations using power-kill switches
1.3.5 Demonstrate established procedures for the use of fire extinguishers
1.3.6 Demonstrate basic first aid procedures

Competency 1.4 Follow established procedures for the handling and disposal of hazardous materials M11,R12

Competency Builders:

1.4.1 Identify the location of material safety data sheets (MSDS's)
1.4.2 Interpret MSDS information for each hazardous material
1.4.3 Follow procedures specified by each MSDS
1.4.4 Recognize product labeling color codes
1.4.5 Interpret product labeling
1.4.6 Dispose of hazardous materials in accordance with Environmental Protection Agency (EPA) standards

Competency 1.5 Follow established procedures for the use, handling, and storage of tools, materials, and equipment M11,R12

Competency Builders:

1.5.1 Identify potential hazards related to the use of hand tools
1.5.2 Demonstrate safety procedures established for the use of hand tools
1.5.3 Demonstrate established procedures for lifting and carrying large or heavy objects
1.5.4 Use power tools and machinery in accordance with established operating procedures and safety standards
1.5.5 Conduct routine inspections of hand tools and power equipment
1.5.6 Maintain hand tools
1.5.7 Maintain power equipment

Occupational Competency Analysis Profile:

Employability

Unit 1: Career Development

Competency 1.1: Investigate career options I11,M12

Competency Builders:

1.1.1 Determine interests and aptitudes
1.1.2 Identify career options
1.1.3 Research interests, knowledge, abilities, and skills needed in an occupation
1.1.4 Select careers that best match interests and aptitudes
1.1.5 Identify advantages and disadvantages of career options, including self-employment and nontraditional careers

Competency 1.2: Utilize career information I11,M12

Competency Builders:

1.2.1 Identify a range of career information resources
1.2.2 Use a range of resources to obtain career information (e.g., handbooks, career materials, labor market information, and computerized career-information delivery systems)
1.2.3 Demonstrate knowledge of various classification systems that categorize occupations and industries (e.g., *Dictionary of Occupational Titles*)
1.2.4 Describe the educational requirements of various occupations
1.2.5 Identify individuals in selected occupations as possible information resources, role models, or mentors
1.2.6 Describe the impact of factors such as population, climate, employment trends, and geographic location on occupational opportunities
1.2.7 Assess differences in the wages, benefits, annual incomes, cost of living, and job opportunties associated with selected career options
1.2.8 Determine labor market projections for selected career options

Competency 1.3: Participate in a career exploration activity I11,M12

Competency Builders:

1.3.1 Identify career exploration activities (e.g., job shadowing, mentoring, volunteer experiences, part-time employment, and cooperative education)
1.3.2 Compare traits, skills, and characteristics required for specific career choices with individual's traits, skills, and characteristics
1.3.3 Recognize potential conflicts between personal characteristics and career choice areas
1.3.4 Describe the impact of exploration activities on current career choices

Competency 1.4: **Assess the relationship between educational achievement and career planning** I11,M12

Competency Builders:

1.4.1 Describe how skills developed in academic and vocational programs relate to career goals
1.4.2 Describe how education relates to the selection of a college major, further training, and/or entry into the job market
1.4.3 Identify skills that can apply to a variety of occupational requirements
1.4.4 Explain the importance of possessing learning skills in the workplace

Competency 1.5: **Develop an individual career plan** I11,M12

Competency Builders:

1.5.1 Identify career goal(s)
1.5.2 Identify worker conditions, education, training, and employment opportunities related to selected career goal(s)
1.5.3 Describe school and community resources available to help achieve career goal(s)
1.5.4 Identify career ladders possible within selected career goal(s)*
1.5.5 Identify additional experiences needed to move up identified career ladders*
1.5.6 Recognize that changes may require retraining and upgrading of employees' skills

Competency 1.6: **Annually review/revise the individual career plan** I11,M12

Competency Builders:

1.6.1 Identify experiences that have reinforced selection of the specific career goal(s) listed on the individual career plan
1.6.2 Identify experiences that have changed the specific career goal(s) listed on the individual career plan
1.6.3 Modify the career goals(s) and educational plans on the individual career plan
1.6.4 Ensure that parents or guardians provide input into the individual career plan process
1.6.5 Identify the correlation between the individual career plan and the actual courses to be taken in high school
1.6.6 Identify the correlation between the individual career plan and postsecondary training, adult education, or employment

Unit 2: Decision Making and Problem Solving

Competency 2.1: **Apply decision-making techniques in the workplace** I11,M12

Competency Builders:

2.1.1 Identify the decision to be made
2.1.2 Compare alternatives
2.1.3 Determine the consequences of each alternative
2.1.4 Make decisions based on values and goals
2.1.5 Evaluate the decision made

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Competency 2.2: **Apply problem-solving techniques in the workplace** I11,M12

Competency Builders:

2.2.1 Diagnose the problem, its urgency, and its causes
2.2.2 Identify alternatives and their consequences in relation to the problem
2.2.3 Recognize multicultural and nonsexist dimensions of problem solving
2.2.4 Explore possible solutions to the problem using a variety of resources
2.2.5 Compare/contrast the advantages and disadvantages of each solution
2.2.6 Determine appropriate action
2.2.7 Implement action
2.2.8 Evaluate results of action implemented

Unit 3: Work Ethic

Competency 3.1: **Evaluate the relationship of self-esteem to work ethic** I11,M12

Competency Builders:

3.1.1 Identify special characteristics and abilities in self and others
3.1.2 Identify internal and external factors that affect self-esteem
3.1.3 Identify how individual characteristics relate to achieving personal, social, educational, and career goals
3.1.4 Identify the relationship between personal behavior and self-concept

Competency 3.2: **Analyze the relationship of personal values and goals to work ethic both in and out of the workplace** I11,M12

Competency Builders:

3.2.1 Distinguish between values and goals
3.2.2 Determine the importance of values and goals
3.2.3 Evaluate how one's values affect one's goals
3.2.4 Identify own short- and long-term goals
3.2.5 Prioritize own short- and long-term goals
3.2.6 Identify how one's values are reflected in one's work ethic
3.2.7 Identify how interactions in the workplace affect one's work ethic
3.2.8 Identify how life changes affect one's work ethic

Competency 3.3: **Demonstrate work ethic** I11,M12

Competency Builders:

3.3.1 Examine factors that influence work ethic
3.3.2 Display initiative
3.3.3 Demonstrate dependable attendance and punctuality
3.3.4 Demonstrate organizational skills
3.3.5 Adhere to schedules and deadlines
3.3.6 Demonstrate a willingness to learn
3.3.7 Demonstrate a willingness to accept feedback and evaluation
3.3.8 Demonstrate interpersonal skills required for working with and for others

Continued

Competency 3.3: Demonstrate work ethic—Continued

3.3.9 Describe appropriate employer-employee interactions for various situations
3.3.10 Express feelings and ideas in an appropriate manner for the workplace

Competency 3.4: Demonstrate safety skills I11,M12

Competency Builders:

3.4.1 Practice safe work habits
3.4.2 Identify safety hazards
3.4.3 Employ preventative safety measures
3.4.4 Demonstrate appropriate care and use of equipment and facilities to ensure safety
3.4.5 Comply with safety and emergency procedures

Unit 4: Job-Seeking Skills

Competency 4.1: Prepare for employment I11,M12

Competency Builders:

4.1.1 Identify traditional and nontraditional employment sources
4.1.2 Utilize employment sources
4.1.3 Research job opportunities, including nontraditional careers
4.1.4 Interpret equal employment opportunity laws
4.1.5 Explain the critical importance of personal appearance, hygiene, and demeanor throughout the employment process
4.1.6 Prepare for generic employment tests and those specific to an occupation/organization

Competency 4.2: Develop a résumé I11,M12

Competency Builders:

4.2.1 Identify personal strengths and weaknesses
4.2.2 List skills and/or abilities, career objective(s), accomplishments/achievements, educational background, work experience, volunteer/community contributions, and organizational memberships
4.2.3 Select an acceptable résumé format
4.2.4 Use correct grammar and spelling and concise wording
4.2.5 Secure references
4.2.6 Complete the résumé

Competency 4.3: Complete the job application process I11,M12

Competency Builders:

4.3.1 Explain the importance of an application form
4.3.2 Obtain job application forms
4.3.3 Demonstrate appropriate behaviors (e.g., personal appearance, hygiene, and demeanor) for obtaining job application forms in person
4.3.4 Describe methods for handling illegal questions on job application forms
4.3.5 Demonstrate legible written communication skills using correct grammar and spelling and concise wording

Continued

Competency 4.3: Complete the job application process—Continued

4.3.6 Return application to appropriate person
4.3.7 Request interview
4.3.8 Follow up on application status

Competency 4.4: Demonstrate interviewing skills I11,M12

Competency Builders:

4.4.1 Investigate interview procedures
4.4.2 Demonstrate appropriate behaviors (e.g. appearance, hygiene, and demeanor) for the interview
4.4.3 Demonstrate question-and-answer techniques
4.4.4 Demonstrate methods for handling difficult and/or illegal interview questions
4.4.5 Use correct grammar and concise wording

Competency 4.5: Secure employment I11,M12

Competency Builders:

4.5.1 Identify present and future employment opportunities within an occupation/organization
4.5.2 Research the organization/company
4.5.3 Use follow-up techniques to enhance employment potential
4.5.4 Evaluate job offer(s)
4.5.5 Respond to job offer(s)

Unit 5: Job Retention and Career Advancement Skills

Competency 5.1: Analyze the organizational structure of the workplace I11,M12

Competency Builders:

5.1.1 Identify employer expectations regarding job performance, work habits, attitudes, personal appearance, and hygiene
5.1.2 Comply with company policies and procedures
5.1.3 Examine the role/relationship between employee and employer
5.1.4 Recognize opportunities for advancement and reasons for termination
5.1.5 Recognize the organization's ethics.

Competency 5.2: Maintain positive relations with others I11,M12

Competency Builders:

5.2.1 Exhibit appropriate work habits and attitudes
5.2.2 Identify behaviors for establishing successful working relationships
5.2.3 Cooperate through teamwork and group participation
5.2.4 Demonstrate a willingness to compromise
5.2.5 Identify methods for dealing with harassment, bias, and discrimination based on race, color, national origin, gender, religion, disability, or age
5.2.6 Cooperate with authority
5.2.7 Accept supervision

Competency 5.3: Demonstrate accepted social and work behaviors I11,M12

Competency Builders

5.3.1 Demonstrate a positive attitude
5.3.2 Demonstrate accepted conversation skills
5.3.3 Use good manners
5.3.4 Accept responsibility for assigned tasks
5.3.5 Demonstrate personal hygiene
5.3.6 Demonstrate knowledge of a position
5.3.7 Perform quality work

Competency 5.4: Analyze opportunities for personal and career growth* I11,M12

Competency Builders:

5.4.1 Determine opportunities within chosen occupation/organization*
5.4.2 Determine other career opportunities outside chosen occupation/ organization*
5.4.3 Evaluate the factors involved in considering a new position within or outside an occupation/ organization*
5.4.4 Exhibit characteristics needed for advancement*

Unit 6: Technology in the Workplace

Competency 6.1: Demonstrate knowledge of technology issues I11,M12

Competency Builders:

6.1.1 Demonstrate knowledge of the characteristics of technology
6.1.2 Demonstrate knowledge of how technology systems are applied
6.1.3 Assess the impact of technology on the individual, society, and environment
6.1.4 Demonstrate knowledge of the evolution of technology
6.1.5 Identify how people, information, tools and machines, energy, capital, physical space, and time influence the selection and use of technology
6.1.6 Identify legal and ethical issues related to technology (e.g., confidentiality, information sharing, copyright protection)

Competency 6.2: Demonstrate skills related to technology issues I11,M12

Competency Builders:

6.2.1 Exhibit willingness to adapt to technological change
6.2.2 Utilize technological systems
6.2.3 Utilize a variety of resources and processes to solve technological problems
6.2.4 Employ higher-order thinking skills for solving technological problems
6.2.5 Work as a team member in solving technological problems
6.2.6 Use technology in a safe and responsible manner
6.2.7 Apply science, mathematics, communication, and social studies concepts to solve technological problems
6.2.8 Demonstrate ingenuity and creativity in the use of technology*
6.2.9 Utilize a formal method (systems approach) in solving technological problems*

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Unit 7: Lifelong Learning

Competency 7.1: Apply lifelong learning practices to individual situations I11,M12

Competency Builders:

7.1.1 Define lifelong learning
7.1.2 Identify factors that cause the need for lifelong learning
7.1.3 Identify changes that may require the retraining and upgrading of employee's skills
7.1.4 Identify avenues for lifelong learning
7.1.5 Participate in lifelong learning activities

Competency 7.2: Adapt to change I11,M12

Competency Builders:

7.2.1 Analyze the causes and effects of change
7.2.2 Identify the effect of change on goals
7.2.3 Identify the importance of flexibility when reevaluating goals
7.2.4 Evaluate the need for lifelong learning experiences in adapting to change

Unit 8: Economic Education

Competency 8.1: Analyze how an economy functions as a whole I11,M12

Competency Builders:

8.1.1 Describe how individuals and societies make choices to satisfy needs and wants with limited resources
8.1.2 Identify how production factors (land, labor, capital, and entrepreneurship) are used to produce goods and services
8.1.3 Illustrate how individuals and households exchange their resources for the income they use to buy goods and services
8.1.4 Explain how individuals and business firms use resources to produce goods and services to generate income
8.1.5 Identify characteristics of command, market, and traditional economies*
8.1.6 Describe how all levels of government assess taxes in order to provide services

Competency 8.2: Analyze how an economic system is a framework within which decisions are made by individuals and groups I11,M12

Competency Builders:

8.2.1 List several individuals and groups that make economic decisions at the local, state, and national levels
8.2.2 Identify the important roles that local, state, and national governments play in a market economy
8.2.3 List examples of how government decisions affect individuals

Continued

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Competency 8.2: ***Analyze how an economic system is a framework within which decisions are made by individuals and groups—Continued*** I11,M12

8.2.4 Identify how geographic locations affect the political and economic systems of the world
8.2.5 Evaluate how markets allocate goods and services
8.2.6 Explain how resources, goods, and services are exchanged in markets
8.2.7 Explain competition and its effect on the market

Competency 8.3: Analyze the importance of making informed personal financial decisions I11,M12

Competency Builders:

8.3.1 Describe the need for personal management records
8.3.2 Create a personal budget
8.3.3 Create a budget for a family of four for one month
8.3.4 Explain how credit affects personal/family finances
8.3.5 Identify steps to avoid credit problems
8.3.6 Make informed consumer choices in response to personal needs and wants
8.3.7 Identify factors that influence consumer decisions (e.g., advertisements, peer groups, price, and location)
8.3.8 Explain the costs and benefits for individuals of various types of taxation at the local, state, and federal levels

Unit 9: Balancing Work and Family

Competency 9.1: Analyze the effects of family on work I11,M12

Competency Builders:

9.1.1 .Recognize how family values, goals, and priorities are reflected in the workplace
9.1.2 Identify present and future family structures and responsibilities
9.1.3 Describe personal and family roles
9.1.4 Analyze concerns of working parent(s)
9.1.5 Examine how family responsibilities can conflict with work
9.1.6 Identify ways to resolve family-related conflicts
9.1.7 Explain how to use support systems/community resources to help resolve family-related conflicts

Competency 9.2: Analyze the effects of work on family I11,M12

Competency Builders:

9.2.1 Identify responsibilities associated with paid and nonpaid work
9.2.2 Compare the advantages and disadvantages of multiple incomes
9.2.3 Explain how work can conflict with family responsibilities
9.2.4 Explain how work-related stress can affect families
9.2.5 Identify family support systems and resources

Unit 10: Citizenship in the Workplace

Competency 10.1: **Exercise the rights and responsibilities of citizenship in the workplace** I11,M12

Competency Builders:

10.1.1 Identify the basic rights and responsibilities of citizenship in the workplace
10.1.2 Identify situations in which compromise is necessary
10.1.3 Examine how individuals from various backgrounds contribute to the workplace
10.1.4 Demonstrate initiative to facilitate cooperation
10.1.5 Give/receive constructive criticism to enhance cooperation

Competency 10.2: **Prepare to work in a multicultural society** I11,M12

Competency Builders:

10.2.1 Identify ways to live in a multicultural society with mutual respect and appreciation for others
10.2.2 Examine how culture and experience create differences in people
10.2.3 Demonstrate respect for the contributions made by all people
10.2.4 Investigate personal cultural background as a means of developing self-respect
10.2.5 Make personal choices that reduce discrimination, isolation, and prejudice
10.2.6 Work effectively with people irrespective of their race, gender, religion, ethnicity, disability, age, or cultural background

Unit 11: Leadership

Competency 11.1: **Evaluate leadership styles appropriate for the workplace** I11,M12

Competency Builders:

11.1.1 Identify characteristics of effective leaders
11.1.2 Compare leadership styles
11.1.3 Demonstrate effective delegation skills
11.1.4 Investigate empowerment concepts
11.1.5 Identify opportunities to lead in the workplace

Competency 11.2: **Demonstrate effective teamwork skills** I11,M12

Competency Builders:

11.2.1 Identify the characteristics of a valuable team member
11.2.2 Identify methods of involving each team member
11.2.3 Contribute to team efficiency and success
11.2.4 Determine ways to motivate team members

Competency 11.3: Utilize effective communication skills I11,M12

Competency Builders:

11.3.1 Identify the importance of listening
11.3.2 Demonstrate effective listening skills
11.3.3 Demonstrate assertive communication techniques
11.3.4 Recognize the importance of verbal and nonverbal cues and messages
11.3.5 Prepare written material
11.3.6 Analyze written material
11.3.7 Give/receive feedback
11.3.8 Communicate thoughts
11.3.9 Use appropriate language
11.3.10 Follow oral and written instructions
11.3.11 Demonstrate effective telephone techniques
11.3.12 Identify technology in communications

Unit 12: Entrepreneurship

Competency 12.1: Evaluate the role of small business I11,M12

Competency Builders:

12.1.1 Identify the impact of small business on the local economy
12.1.2 Examine the relationship of small business to a national (USA) and global economy
12.1.3 Identify factors that contribute to the success of small business
12.1.4 Identify factors that contribute to the failure of small business
12.1.5 Identify the components of a business plan

Competency 12.2: Examine entrepreneurship as a personal career option I11,M12

Competency Builders:

12.2.1 Evaluate personal interests and skills
12.2.2 Compare personal interests and skills with those necessary for entrepreneurship
12.2.3 Determine motives for becoming an entrepreneur
12.2.4 Identify the advantages and disadvantages of owning a small business
12.2.5 Compare business ownership to working for others

HEART of OHIO TECH PREP CONSORTIUM

Pickerington High School

Construction Technology

Academic Competencies

August 15, 1996

Algebra II Competencies

+ indicates that this should have been mastered in a previous course. We will review this topic as it applies to our course, but we may not test on it.

** indicates the beginning of a specific competency. Other items with the same 5 numbers at the beginning are competency builders

- indicates introduction as time permits

The student will

**	3.01.01.00	Solve linear equations.
+	3.01.01.01	Combine like terms
+	3.01.01.02	Use the distributive property to remove grouping symbols and the addition/subtraction property to combine like terms to simplify expressions
+	3.01.01.03	Solve equations in one variable utilizing one operation
+	3.01.01.04	Solve equations in one variable utilizing two or more operations
+	3.01.01.05	Describe and use the logic of equivalence in working with equations, inequalities, and functions
	3.01.01.06	Identify variables, constants, terms, expressions, and coefficients
+	3.01.01.07	Define absolute value
	3.01.01.08	Evaluate algebraic expressions
	3.01.01.09	Solve a literal equation or formula for a specified variable, and use formulas
	3.01.01.10	Recognize the properties of equalities
	3.01.01.11	Solve 2x2 and 3x3 systems of equations by linear combination and by using matrices
+	3.01.01.12	Solve a 2x2 system of linear equations by substitution or elimination
+	3.01.01.13	Apply the rules for solving linear equations in one variable
	3.01.01.14	Use formulas
	3.01.01.15	Use handheld graphic calculators to solve linear equations and graph simple functions
	3.01.01.16	Solve linear equations in one variable containing an absolute value symbol
**	3.01.02.00	Understand and use the properties of exponents
+	3.01.02.01	Define exponent
+	3.01.02.02	Compare and compute using scientific notation
	3.01.02.03	Determine the roots of natural numbers using a calculator Use exponential form to write and evaluate radicals
	3.01.02.04	Determine the principal square root and recognize square roots of negatives as being imaginary
+	3.01.02.05	Divide terms having factors with exponents
	3.01.02.06	Multiply and divide polynomial expressions
	3.01.02.07	Operate with radicals and leave the answer in simplest radical form, as well as in decimal form to the nearest hundredth

	3.01.02.08	Apply the properties of exponents to simplify polynomial expressions
	3.01.02.09	Multiply terms having factors with exponents.
	3.01.02.10	Solve radical equations
**	3.01.03.00	Factor a polynomial of two or more terms; use the rational root theorem to choose appropriate choices of roots; use synthetic division to determine roots
	3.01.03.01	Apply the distributive property in removing common factors
	3.01.03.02	Factor the difference of two squares
	3.01.03.03	Factor quadratic trinomials
	3.01.03.04	Factor the sum and differences of perfect cubes
**	3.01.04.00	Solve inequalities in one variable and two variables and graph their solutions on a number line or coordinate plane
+	3.01.04.01	Combine like terms
+	3.01.04.02	Use the substitution property to evaluate expressions and formulas
+	3.01.04.03	Evaluate algebraic expressions
	3.01.04.10	Solve problems involving statements of inequality, including absolute value inequalities
**	3.01.05.00	Recognize, relate, and use the equivalent ideas of zeros of a function, roots of an equation, and the solution of an equation in terms of graphical and symbolic representation.
	3.01.05.10	Explore and describe characterizing features of functions
	3.01.05.11	Find x and y intercepts of a line
	3.01.05.12	Decide whether or not a relation is a function. Use function notation. Find domains and ranges
**	3.01.06.00	Graph equation in one and two variables, including graphs of conic sections, graphs of logarithmic equations and exponential equations, graphs of trigonometric equations.
	3.01.06.02	Explore and describe characterizing features of functions.
	3.01.06.03	Describe problem situations by using and relating numerical, symbolic, and graphical representations
	3.01.06.04	Use the language and notation of functions in symbolic and graphing settings
	3.01.06.06	Write equations for a line
	3.01.06.07	Use a graphing calculator or computer to generate the graph of a function
	3.01.06.08	Graph a linear equation using the slope-intercept method
	3.01.06.09	Translate among tables, algebraic expressions, and graphs of functions
	3.01.06.10	Estimate the shape of graphs of various functions and algebraic expressions
	3.01.06.12	Graph basic functions using the Cartesian coordinate system
**	3.01.07.00	Demonstrate the ability to translate statements and equations from written to algebraic form and algebraic form to written form.
**	3.01.08.00	Determine the slope, midpoint, and distance between two points
	3.01.08.01	Solve problems related to sets of points on a Cartesian coordinate system

**	3.01.09.00	Model real-world phenomena with polynomial and exponential functions, including the use of curve fitting to predict from data.
**	3.02.05.00	Solve right triangle problems using the Pythagorean theorem, and trigonometric ratios.
	3.02.05.01	Apply the Pythagorean theorem
	3.02.05.02	Identify basic functions of sine, cosine, and tangent
	3.02.05.03	Compute and solve problems using basic trig functions
**	3.02.06.00	Demonstrate inductive and deductive reasoning through application to various subject areas
+	3.02.06.01	Demonstrate an understanding of and ability to use proof
**	3.03.01.00	Estimate answers, compute, and solve problems involving real numbers.
+	3.03.01.01	Round off decimals to one or more places
+	3.03.01.02	Round and/or truncate numbers to designated place value
+	3.03.01.03	Round off single and multiple digit whole numbers
	3.03.01.04	Estimate measurements
+	3.03.01.05	Use mental computation when computer and calculator are inappropriate
**	3.03.02.00	Compare and contrast the real number system, the rational number system, and the whole number system.
**	3.03.03.00	Determine if a solution to a mathematical problem is reasonable (estimate)
**	3.03.04.00	Select and compute using appropriate units of measure.
**	3.04.01.00	Collect and organize data into tables, charts, and graphs
	3.04.01.01	Take a random sample from a population
**	3.04.02.00	Determine the probability of an event.
	3.04.02.01	Determine the probability of more than one event
-	3.04.02.02	Use computer simulations & random number generation to estimate probability
**	3.04.03.00	Understand and apply measures of central tendency, variability, and correlation.
	3.04.03.01	Compute and interpret mean
	3.04.03.02	Compute and interpret median and/or mode
	3.04.03.03	Understand what a normal distribution is
	3.04.03.04	Understand what a uniform distribution is
**	3.05.02.00	Solve systems of linear equations and inequalities using matrices, graphs, and algebraic methods.
	3.05.02.01	Solve systems of linear equations with up to 3 variables
	3.05.02.02	Solve a 3x3 system of linear equations using matrices
	3.05.02.03	Describe and solve algebraic situations with matrices
- **	3.05.03.00	Understand the complex number system and exhibit facility with its operation.
	3.05.03.01	Solve problems having complex solutions
	3.05.03.02	Examine complex numbers as zeros of functions
-	3.05.03.03	Graph basic functions using polar coordinate system
-	3.05.03.04	Graph using polar coordinates
-	3.05.03.05	Contrast and compare algebras of rational , real, and complex numbers with characteristics of a matrix algebra system

	3.05.03.06	Determine factors and roots of a polynomial with complex roots
-	3.05.03.07	Graph complex numbers
-	3.05.03.08	Add, subtract, multiply and divide complex numbers in rectangular and polar form
-	3.05.03.09	Convert complex numbers from rectangular form to the exponential
**	3.05.04.00	Analyze exponential and logarithmic functions.
	3.05.04.01	identify and define inverse functions
	3.05.04.02	Do calculations involving exponential and logarithmic expressions and functions
	3.05.04.03	Use definitions to show the relationship between exponential and logarithmic functions
	3.05.04.04	Graph the logarithmic and exponential functions
-	3.05.04.05	Describe and use the inverse relationship between functions including exponential and logarithmic
	3.05.04.06	Use graphing calculators to generate tables to plot exponential and logarithmic curves
	3.05.04.07	Use properties of logarithms to solve problems
-	3.05.04.08	Use graphing calculators to calculate logarithms in bases other than 10
	3.05.04.09	Solve elementary logarithmic and exponential equations
**	3.05.05.00	Simplify and solve quadratic equations
+	3.05.05.01	Simplify algebraic expressions and multiply and divide polynomials along with solving quadratic equations
	3.05.05.02	Solve a quadratic equation by factoring, by completing the square, and by using the quadratic formula
- **	3.06.01.00	Solve problems using the trigonometric functions
	3.06.01.01	Know the sign of each circular function in any quadrant
-	3.06.01.02	Know the circular functions of the special angles: $\pi / 6$, $\pi / 4$, $\pi / 3$
-	3.06.01.03	Define the circular functions on a circle of radius r with the center at the origin
-	3.06.01.04	Understand the relationship of the circular functions and the trig functions
-	3.06.01.05	Identify and use the trig functions for the sum of angles
	3.06.01.06	Solve right triangle problems
	3.06.01.08	Apply the law of sines in finding measures of sides and angles of triangles
	3.06.01.09	Apply the law of cosines in finding measure of sides and angles of triangles
-	3.06.01.10	Concert between radians and degrees
-	3.06.01.11	Solve problems with negative rotations
	3.06.01.12	Solve application problems involving right triangles
- **	3.06.02.00	Recognize and identify graphs of the trigonometric functions
-	3.06.02.01	Recognize and graph basic trig curves
-	3.06.02.02	Explore graphs in three dimensions
-	3.06.02.04	Solve trigonometric equations and verify trigonometric identities
-	3.06.02.05	Use the fundamental trig identities in performing operations
- **	3.06.03.00	Demonstrate an understanding in the use of vectors
	3.06.03.01	Apply vectors in problem solutions

-	3.06.04.02	Deduce properties of figures using vectors
	3.06.03.03	Develop and use vectors to represent distance and magnitude including operations
-	3.06.03.04	Explore relationships between complex numbers and vectors
-	3.06.03.05	Add and subtract vectors geometrically
-	3.06.03.06	Use graphing calculators in the study of vectors
-	3.07.01.00	Understand the connections between trigonometric functions, exponential functions, logarithmic functions, complex numbers, and series.
**	3.08.01.00	Look for and use appropriate problem solving strategies
		Select appropriate notation
		Look for a pattern
		Use simulation
		Make a graph
		Guess and check
		Make a drawing or diagram
		Make a model
		Construct a table
		Restate the problem
		Identify a subgoal
		Identify given, needed, and extraneous information
		Write an open sentence
		Solve a simpler or similar problem
		Work backwards
		Account for all possibilities
**	3.09.01.00	Understand and apply measurements and the probability that any measurement is accurate to some designated specification
**	3.10.01.00	Use estimation to eliminate choices in multiple-choice tests; use estimation to determine the reasonableness of an answer; use mental computation when appropriate

TechPrep College English 11

+ indicates that should have been mastered in a previous course.
* indicates the competency will be developed at this grade level and will be mastered at the next level (12 or Associate Degree).

Effective Reading Skills

Junior year:

* 1.01.01.00 Differentiate between fact, opinion, and inference.
* 1.01.02.00 Cite details that support or do not support predictions.
+ 1.01.03.00 Recognize the intent and use of propaganda.
* 1.01.04.00 Identify and summarize ideas, information, and events that are explicitly stated in written material.
+ 1.01.06.00 Identify and explain the main and subordinate ideas (stated or implied) in a written work.
* 1.01.07.00 Apply interpretive level comprehension skills to generate ideas and/or hypotheses about the content.
* 1.01.08.00 Find, understand, interpret, and apply information from a variety of sources (books, manuals, newspapers, periodicals, directories, reference works, computer printouts, and electronic sources).
* 1.01.09.00 Use the features of books and reference materials, such as table of contents, preface, introduction, titles and subtitles, index, glossary, appendix, and bibliography.
* 1.01.10.00 Define and use unfamiliar words and specialized vocabulary (including abbreviations, acronyms, concepts, and jargon) by using structural analysis,decoding, contextual clues, dictionaries, and computers.
* 1.01.12.00 Read and follow complex directions.
+ 1.01.13.00 Determine the author's purpose.
* 1.01.15.00 Recognize and interpret organizational patterns of writing (e.g. cause and effect, comparison and contrast, and simple listing).
* 1.01.18.00 Explore and analyze a variety of cultural elements, attitudes, beliefs, and value structures through reading.

Junior and senior year:

* 1.01.11.00 Read and understand short notes, memos, letters, and forms.
* 1.01.14.00 Read, evaluate, and respond critically to various literature forms, genres, and printed media.

Additional:

* Critique a variety of American literature (and British literature at the senior level) with regard to elements of literature and literary techniques.
* Compare/contrast genres of literature.

* Read as a problem-solving strategy to clarify personal thinking and understanding.
* Engage in self-selected reading activities.

Effective Speaking and Presentation Skills:

Junior year:

+ 1.02.01.00 Give oral directions and clear explanations.
* 1.02.02.00 Participate critically and constructively in the exchange of ideas, particularly during class discussions and conferences.
+ 1.02.03.00 Demonstrate correct usage of vocabulary.
* 1.02.04.00 Demonstrate an awareness and understanding of interpersonal communication skills (verbal and nonverbal) in one-to-one and small group settings (role-playing).
* 1.02.05.00 Speak effectively using nonverbal communication such as eye contact, posture, and gestures.
+ 1.02.06.00 Select topics suitable to audience, situation, and purpose.
+ 1.02.11.00 Demonstrate proper telephone etiquette.

Junior/ senior year:

* 1.02.07.00 Demonstrate effective speaking skills in seeking employment and inutilizing management skills on the job.
* 1.02.08.00 Give formal and informal talks and speeches.
* 1.02.09.00 Demonstrate the difference between informing and persuading and use the appropriate techniques of content and delivery for each purpose.
+ 1.02.10.00 Use visual media.

Effective Writing Skills:

Junior/senior year:

+ 1.03.01.00 Demonstrate ability to use different forms of writing (e.g., literary response, business and technical communicative modes, personal responses, journals, research and recording).
+ 1.03.02.00 Demonstrate appropriate selection of mode, purpose, audience, point of view, and organization of information in written assignments.
* 1.03.03.00 Demonstrate expertise in word processing, graphics and/or desktop publishing aids for writing.
+ 1.03.04.00 Apply writing process techniques: prewriting, drafting, revising, editing/proofreading, publishing.
+ 1.03.05.00 Demonstrate ability to evaluate written assignments using a diagnostic rubric.

*   1.03.06.00 Develop and maintain a professional writing portfolio

Additional:

*   Reinforce knowing/revising the traditional writing conventions (grammar, punctuation, capitalization, sentence structure).

*   Reinforce attention to traditional genres: narration, exposition, persuasion as well as other forms of composition.

Effective Listening Skills (Most of these have been learned at other grade levels. All are at the reinforcement level, but special attention still needs to be given to several competencies at the reinforcement level.)

Junior year:

+   1.04.01.00 Follow spoken directions.

+   1.04.02.00 Distinguish between fact and opinion.

+   1.04.06.00 Take accurate notes which summarize material presented from spoken conversations, including telephone messages.

Junior/senior year:

+   1.04.03.00 Make inferences and draw conclusions from verbal and nonverbal messages.

+   1.04.04.00 Identify and comprehend the main and subordinate ideas in lecture and discussions, questions to clarify information heard, and report accurately what others have said.

*   1.04.07.00 Recognize multi-cultural differences when listening.

Critical Viewing/Graphic/Observation Skills:

Junior year:

+   1.05.01.00 Read and understand graphs, charts, and tables to obtain factual information.

*   1.05.02.00 Produce and utilize effective communication skills in development of graphs, tables, and charts to communicate ideas.

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Junior/senior year:

+ 1.05.03.00 Critically view historical or contemporary events, via TV or videotape, and make appropriate observations.

* 1.05.04.00 Analyze the effects of advertising and other visual media for direct and hidden messages, including propaganda devices.

* 1.05.05.00 Communicate through use of videotape and computer presentations.

Civil Engineering Science Course of Study - Pickerington High School

Secondary Exit Competencies - Grade 11

r=review
i=introduce
m=master

Soils Unit

4.02.03.08 (r) Describe how human activities interfere with biological diversity. (ie. how modern practices affect the diversity of soil organisms.)

Hydrology Unit

4.02.03.06 (r) Explain and present examples of the importance of water to sustain life in terms of available water sources, water quality, and quantification.

Pollution Unit

4.02.03.07 (i) Explain interrelationship of wastewater collection, treatment, and public health in terms of organic and inorganic pollutant concentrations and pathogenic organisms.

Physical Geology Unit

4.02.03.05 (m) Identify ways to take responsibility for living in a global environment. (ie. identify ways to minimize problems associated with mining and mineral exploration)

Chemistry Unit

4.01.01.00 (i) Explore atomic theory and present findings using various representational formats.
4.01.01.01 (i) Describe a mechanism of bond formation and identify the type of chemical bond formed as ionic, covalent, or metallic.
4.01.01.03 (r) Describe charge and ionic compounds in the context of electrochemical theories.
4.01.01.06 (r) Demonstrate knowledge of chemical symbolism which will include symbols, formulas, and equations.
4.01.02.01 (i) State a scheme of matter which includes elements, compounds, and mixtures.
4.03.03.02 (i) Define specific heat capacity and latent heat.

Natural Disasters Unit
4.02.03.00 (r) Formulate an understanding of the relationship about organisms, their physical surroundings and their change process. (ie. how can mankind live in harmony with their surroundings)

Environmental Fundamentals Unit
4.05.01.07 (i) Identify problems rooted in science and technology (ie. the effects of hazardous waste on humans)
4.02.03.01 (r) Describe the interrelationship of an organism with its environment, including: pollution, populations, community, conservation, habitat, and ecosystem.

Scientific Processes Unit
4.04.01.00 (r) Identify and manipulate lab apparatus and materials safely.
4.04.02.00 (r) Demonstrate familiarity with lab safety equipment.
4.05.01.01 (r) Describe the role of observation and experimentation in the development of scientific theories.
4.05.01.02 (i) Describe the importance of using models in scientific thought.
4.05.01.04 (i) Investigate some of the ethical dilemmas of the scientist.
4.05.02.03 (r) Read scientific materials critically.
4.05.02.04 (r) Gather scientific information through library work.
4.05.02.05 (r) Investigate areas of specialization in science.
4.05.02.08 (r) Make predictions from data using concepts, laws, and theories.
4.05.02.10 (i) Predict the effects of changing variables in a given situation. (ie. changing ingredients in making concrete)
4.05.02.13 (r) Make direct measurements using laboratory apparatus.
4.05.02.14 (i) Design, conduct, and evaluate an experiment.
4.05.02.15 (r) Use sampling techniques.
4.05.02.17 (i) Analyze experimental designs.
4.05.03.00 (r) Using observations derived from experimental data, draw conclusions or make inferences.
4.05.03.02 (r) Interpret information presented in pictures, drawings, charts, graphs, mathematical expressions, and scientific literature.

Civil Engineering Science Course of Study - Pickerington High School

Secondary Exit Competencies for 12 grade (Physical Science B)

m = master
i = introduce

Chemistry Unit

m	4.01.01.00	Explore atomic theory and present findings using various representational formats.
m	4.01.01.01	Describe a mechanism of bond formation and identify the type of chemical bond formed as ionic, covalent, or metallic.
m	4.01.01.03	Describe charge and ionic compounds in the context of electrochemical theories.
m	4.01.01.06	Demonstrate knowledge of chemical symbolism which will include symbols, formulas, and equations.
m	4.01.02.01	State a scheme of matter which includes elements, compounds, and mixtures.
m	4.03.03.02	Define specific heat capacity and latent heat.
i	4.01.01.02	Relate the concept of periodicity to atomic properties and the periodic table of elements.
i	4.01.02.00	Perform investigations that require observations over varying periods of time concerning the interrelationship of matter and energy.
i	4.01.02.02	Relate a chemical equation to the concept of chemical change.
i	4.01.02.04	Predict the properties of matter based on data provided in pictures, drawings, charts, graphs, tables, mathematical expressions, and scientific literature.
i	4.01.02.05	Describe the conservation laws and correctly use the standard units for these laws in relation to conservation of mass/energy and conservation of change.
i	4.01.02.06	Describe properties of carbon and organic compounds.
i	4.01.02.07	State the laws of chemical combinations (conservation of mass, definite composition, multiple proportions).
i	4.01.02.08	List assumptions of the kinetic theory of matter.
i	4.01.02.10	Manipulate data in problem solving, including: mole, concentrate, gas law, atomic/molecular problems.
i	4.01.02.11	Discuss the concept of mole.
i	4.01.02.12	State the properties of gasses and laws that apply to gasses.
i	4.01.02.13	Identify applications of Avogadro's hypothesis such as Avogadro's number, molar volume, and gram molecular weight and molar mass.
i	4.01.02.14	Use the kinetic molecular theory to explain states of matter, rates of reaction, and chemical equilibrium.
i	4.01.02.15	Stoichiometric relationships.

Scientific Processes Unit

m	4.04.01.00	Identify and manipulate lab apparatus and materials safely.
m	4.04.02.00	Demonstrate familiarity with lab safety equipment.
m	4.05.01.01	Describe the role of observation and experimentation in the development of scientific theories.
m	4.05.01.02	Describe the importance of using models in scientific thought.
m	4.05.01.04	Investigate some of the ethical dilemmas of the scientist.
m	4.05.02.03	Read scientific materials critically.
m	4.05.02.04	Gather scientific information through library work.
m	4.05.02.05	Investigate areas of specialization in science.
m	4.05.02.08	Make predictions from data using concepts, laws, and theories.
m	4.05.02.10	Predict the effects of changing variables in a given situation. (ie. changing ingredients in making concrete)
m	4.05.02.13	Make direct measurements using laboratory apparatus.
m	4.05.02.14	Design, conduct, and evaluate an experiment.
m	4.05.02.15	Use sampling techniques.
m	4.05.02.17	Analyze experimental designs.
m	4.05.03.00	Using observations derived from experimental data, draw conclusions or make inferences.
m	4.05.03.02	Interpret information presented in pictures, drawings, charts, graphs, mathematical expressions, and scientific literature.

Physics Unit

i	4.03.01.00	Analyze change within a system when inputs, outputs, and interactions are altered to explain the behavior of changes.
i	4.03.01.01	Describe electrical energy, including the interaction of matter and energy, and energy transformations.
i	4.03.01.02	Describe the properties of magnetic fields, electrical fields, and electrical changes.
i	4.03.01.03	Identify and describe basic electrical systems components and theories.
i	4.03.02.00	Using measuring and mathematical techniques, apply the laws of motion and conservation to real physical systems.
i	4.03.02.01	Describe energy transfers and transformation of a system utilizing conservation laws.
i	4.03.02.02	Describe motion in the context of Newton's Law: linear and rotational.
i	4.03.02.03	Define work and energy and relate these concepts to kinetic energy, potential energy, and conservation of energy.
i	4.03.02.04	Define temperature and heat in units commonly used.
i	4.03.02.05	Identify the causes and effects of motion.
i	4.03.02.06	Use vector analysis to represent and solve force problems.
i	4.03.03.03	Discuss the concept of entropy.
i	4.03.04.00	Using the knowledge gained through experimentation of the characteristics of waves, predict how waves will behave as hey interact with each other and various materials.
i	4.03.04.02	Identify the general areas of the electromagnetic spectrum.
i	4.03.04.03	Describe reflection and refraction as applied to mirrors and lenses.
i	4.03.04.04	Describe the particle and wave theories of light.

HEART of OHIO TECH PREP CONSORTIUM

1996

Construction Technologies Model

PART IV:
Postsecondary Competencies

Columbus State Community College

COLUMBUS STATE COMMUNITY COLLEGE
ASSESSMENT MATRIX ♦ ARCHITECTURE TECHNOLOGY

STUDENT OUTCOMES	ENGL 101	MATH 104	ARCH 111	CMGT 120	ARCH 100	ENGL 102	CPT 101	MATH 148	CMGT 121	ARCH 161	COMM 105
1. Create manual and computer graphic representations of orthographic and isometric projections.			F							F	
2. Use geometry to solve problems with areas and intersecting surfaces and lines.			F							F	
3. Work with one- and two-point perspectives, shades and shadows, and free-hand drawing techniques to express relevant ideas graphically.										F	
4. Generate and organize schedules and details within a complete set of architectural working drawings.				F					F	F	
5. Research materials, consult with industry experts, and use CSI standards to create a set of specifications to support the architectural drawings.				F					F		
6. Read and interpret information from architectural drawings for the estimating and bidding process.									F		
7. Use building construction standards and codes to ensure that architectural drawings omply with legal and safety guidelines.				F					F		
8. Assist the architect in solving and drawing structural details by referring to information on statics/strength of materials, basic knowledge of wood structures, and steel and concrete hand books/reference materials.											
9. Create isometric layouts of basic mechanical systems employed in commercial buildings.					F/S					F	
10. Recognize and understand architectural style and historical heritage.											
11. Develop site plan layouts.			F						F	F	
12. Think critically.	F	F/S				F		F/S	F	F	
13. Solve problems.		F/S	F	F	F	F	F	F/S		F	
14. Communicate effectively.	F	F	F		F		F	F		F	F
15. Demonstrate interpersonal skills.					F						
16. Recognize the value of human diversity.					F						
17. Demonstrate life management skills.		F						F			

F=FORMATIVE ASSESSMENT

S=SUMMATIVE ASSESSMENT

COLUMBUS STATE COMMUNITY COLLEGE
ASSESSMENT MATRIX ♦ ARCHITECTURE TECHNOLOGY

STUDENT OUTCOMES	ARCH 113	BMGT 111	LAND 152	ARCH 155	CIVL 232	ARCH 250	ARCH 212	ARCH 232	ARCH 262	ARCH 112
1. Create manual and computer graphic representations of orthographic and isometric projections.	F/S			F		F	F		S	F
2. Use geometry to solve problems with areas and intersecting surfaces and lines.	F/S		F/S	F						
3. Work with one- and two-point perspectives, shades and shadows, and free-hand drawing techniques to express relevant ideas graphically.									F/S	
4. Generate and organize schedules and details within a complete set of architectural working drawings.				F		F				
5. Research materials, consult with industry experts, and use CSI standards to create a set of specifications to support the architectural drawings.				F		F/S		F		
6. Read and interpret information from architectural drawings for the estimating and bidding process.			F	F		F	F			F
7. Use building construction standards and codes to ensure that architectural drawings comply with legal and safety guidelines.				F		F	F	S		
8. Assist the architect in solving and drawing structural details by referring to information on statics/strength of materials, basic knowledge of wood structures, and steel and concrete hand books/reference materials.				F/S	F	F				
9. Create isometric layouts of basic mechanical systems employed in commercial buildings.							F/S			
10. Recognize and understand architectural style and historical heritage.				F						
11. Develop site plan layouts.	F		F/S							
12. Think critically.			F				F		F	F
13. Solve problems.	F	F	F	F	F	F	F		F	F
14. Communicate effectively.									F	
15. Demonstrate interpersonal skills.			F							
16. Recognize the value of human diversity.										
17. Demonstrate life management skills.										

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COLUMBUS STATE COMMUNITY COLLEGE
ASSESSMENT MATRIX ♦ ARCHITECTURE TECHNOLOGY

STUDENT OUTCOMES	CIVL 237	ENGL 204	HUM 1XX	ARCH 214	ARCH 263	SSCI 10X	ARCH 216		ARCH 264	XXX XXX
1. Create manual and computer graphic representations of orthographic and isometric projections.				F	F/S		F		S	
2. Use geometry to solve problems with areas and intersecting surfaces and lines.	F				F/S				S	
3. Work with one- and two-point perspectives, shades and shadows, and free-hand drawing techniques to express relevant ideas graphically.									S	
4. Generate and organize schedules and details within a complete set of architectural working drawings.	F				F/S				F/S	
5. Research materials, consult with industry experts, and use CSI standards to create a set of specifications to support the architectural drawings.	F				F			F	F/S	
6. Read and interpret information from architectural drawings for the estimating and bidding process.	F				F/S				F/S	
7. Use building construction standards and codes to ensure that architectural drawings comply with legal and safety guidelines.	F			F	F/S		F	F	F/S	
8. Assist the architect in solving and drawing structural details by referring to information on statics/strength of materials, basic knowledge of wood structures, and steel and concrete hand books/reference materials.	F/S				S			F	S	
9. Create isometric layouts of basic mechanical systems employed in commercial buildings.				F/S			F/S		S	
10. Recognize and understand architectural style and historical heritage.			F							
11. Develop site plan layouts					F/S				S	
12. Think critically.	F	F		F	F/S	F	F	F	F/S	
13. Solve problems.	F			F	F/S	F	F	F	F/S	
14. Communicate effectively.		F	F		F	F			F/S	
15. Demonstrate interpersonal skills.			F/S			F/S			F	
16. Recognize the value of human diversity.			F/S			F/S				
17. Demonstrate life management skills.										

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COLUMBUS STATE COMMUNITY COLLEGE
ASSESSMENT MATRIX ◆ ARCHITECTURE TECHNOLOGY

STUDENT OUTCOMES	ARCH 113	BMGT 111	LAND 152	ARCH 155	CIVL 232	ARCH 250	ARCH 212	ARCH 232	ARCH 262	ARCH 112
1. Create manual and computer graphic representations of orthographic and isometric projections.	F/S			F		F	F		S	F
2. Use geometry to solve problems with areas and intersecting surfaces and lines.	F/S		F/S	F						
3. Work with one- and two-point perspectives, shades and shadows, and free-hand drawing techniques to express relevant ideas graphically.									F/S	
4. Generate and organize schedules and details within a complete set of architectural working drawings.				F		F				
5. Research materials, consult with industry experts, and use CSI standards to create a set of specifications to support the architectural drawings.				F		F/S		F		
6. Read and interpret information from architectural drawings for the estimating and bidding process.			F	F		F	F			F
7. Use building construction standards and codes to ensure that architectural drawings comply with legal and safety guidelines.				F		F	F	S		
8. Assist the architect in solving and drawing structural details by referring to information on statics/strength of materials, basic knowledge of wood structures, and steel and concrete hand books/reference materials.				F/S	F	F				
9. Create isometric layouts of basic mechanical systems employed in commercial buildings.							F/S			
10. Recognize and understand architectural style and historical heritage.				F						
11. Develop site plan layouts.	F		F/S							
12. Think critically.			F				F		F	F
13. Solve problems.	F	F	F	F	F	F	F		F	F
14. Communicate effectively.									F	
15. Demonstrate interpersonal skills.			F							
16. Recognize the value of human diversity.										
17. Demonstrate life management skills.										

F=FORMATIVE ASSESSMENT

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Architecture Technology
Methods of Formative and Summative Assessment
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Student Outcome	Methods of Formative Assessment	Methods of Summative Assessment
1. Create manual and computer graphic representations of orthographic and isometric projections.	Lab performance and homework exercises manually drafting orthographic and isometric views with correct symbols and notations. Lab performance using computer graphics to draft orthographic and isometric views with correct symbols and notations. Lab performance and homework exercises calculating stairs, structural framing components, and mechanical and electrical systems components sizes, layouts, and spatial allocations. Written and drafted quizzes and midterms. (Architecture 111, 161, 155, 250, 212, 112, 113, 214, 216)	Lab performance producing construction details and complete sets of preliminary and production working drawings using both manual and computer aided drafting. Lab performance writing and editing a project manual including product, reference and performance specifications. Lab performance of BOCA code compliance evaluations for projects. Written and oral tests. (Architecture 263 and 264)
2. Use geometry to solve problems with areas and intersecting surfaces and lines.	Lab performance and homework exercises using elements of geometric analysis and descriptive geometric analysis to find intersections of planes, interference points, surface areas and developments. Lab exercises and calculations related to stress and force resolutions. Lab exercises and calculations related to surveying of land areas. Written, oral and drafted tests. (Architecture 111, 161, 155, and 263/Civil 237/LAND152)	Lab exercise and calculation performance to check building compliance with BOCA requirements. Lab creation of working drawing elements incorporating building geometrics and grids. (Architecture 263 and 264) Layout and measurement of property boundaries in laboratory. LAND152 Written tests and equipment use tests.

Architecture Technology
Methods of Formative and Summative Assessment
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Student Outcome	Methods of Formative Assessment	Methods of Summative Assessment
3. Work with one-and two-point perspectives, shades and shadows, and computer drawing techniques to express relevant ideas graphically.	Laboratory projects laying out and composing sheet of working drawings rendering perspectives and creating free-hand representations of architectural structures. Written and drafted tests. (Arch 161 and 262)	Creating architectural client type presentations including sketches, drawings and models. (Arch 262 and 264)
4. Generate and organize schedules and details within a complete set of architectural working drawings.	Selecting and researching products and creating details incorporating the products evaluating existing architectural drawings for BOCA code compliance. Written and drafted tests. (ARCH 250, 263 and 264)	Creating and selecting schedules and details required to complete architectural working drawing sets for construction projects. Drafted tests. (ARCH 263 and 264)
5. Research materials consult with industry experts, and use CSI standards to create a set of specifications to support the architectural drawings.	Laboratory evaluation of material properties through both destructive and non-destructive ASTM testing procedures. Laboratory exercises reading and completing written exercises related to construction project specifications, calculations to design structural materials to meet requirements of BOCA code. Written tests. (CIVL 120, 155, 250, 232, 263, and 264/CIVL237/CMGT121)	Select materials from manufacturer's literature, check BOCA compliance, and incorporate into architectural working drawings and specifications. Interview manufacturer's representatives about products, collect samples and evaluate for design requirements. (ARCH 264)
6. Read and interpret information from architectural drawings for the estimating and bidding process.	Perform written exercises to read and interpret working drawings. Calculate material quantities from architectural drawings. Written tests. (CMGT121)	

Architecture Technology
Methods of Formative and Summative Assessment
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Student Outcome	Methods of Formative Assessment	Methods of Summative Assessment
7. Use building construction standards and codes to ensure that architectural drawings comply with legal and safety guidelines	Interpret BOCA code application and write specific project requirements, perform BOCA specified tests in laboratory exercises. Various lab exercises and worksheets with mock situations and requirements. Written and drafted tests. (CIVL 120, 155, 250, 212, 214, 216, 263 and 264/ CIVL237/CMGT121	Lab exercises using BOCA, association standards and testing reports to select/reject building construction products for a simulated project. (ARCH 232, 263, 264)
8. Assist the architect in solving and drawing structural details by referring to information on statics/strength of materials, basic knowledge of wood structures, and steel and concrete hand books/reference materials.	Perform simulated structural calculations. Draft structural connections and fabrication drawings. Written tests. (ARCH 155 and 250/CIVL 232, 237)	Lab exercises selecting, modifying, and adapting structural materials and products to the conditions in simulated buildings. (ARCH 155, 263, and 264)
9. Create isometric layouts of basic mechanical systems employed in commercial buildings.	Lab exercise relating site utility, electrical, HVAC, and plumbing to the architectural working drawing and specifications. Written and drafted tests. (ARCH 161, 212, 214, 216)	Final project assignments documenting site utility, electrical, HVAC and plumbing to construction documents. (ARCH 212, 214, 216 and 264)
10. Recognize and understand architectural style and historical heritage.	Performance on quizzes, projects, and written comparisons (ARCH 100)	None
11. Develop site plan layouts for new buildings.	Read and interpret field data to evaluate conditions in simulated lab situations. Written and drafted tests and exercises. (ARCH 111, 161 and LAND 152, CMGT 121)	Lab exercises using surveying equipment to simulate industry field conditions. Written and equipment usage testing. (LAND 152)

Architecture Technology
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Student Outcome	Methods of Formative Assessment	Methods of Summative Assessment
12. Think critically.	Problem solving techniques. Written examinations. Laboratory projects. Design exercises. Quality control labs. BMGT 111	Capstone project. ARCH264: Simulated and actual problem situations to analyze and solve.
13. Solve problems.	Written examination. Laboratory exercises. Project simulations. Intern performance. Design exercises.	Capstone course. Simulated and actual problems to analyze and solve.
14. Communicate effectively.	Group critiques. Group and individual oral presentations. Discussion groups.	Capstone course. Project coordination with team, clients, and other classes.
15. Demonstrate interpersonal skills.	Group critiques. Group research and presentation projects.	Capstone project. Team project assignment requiring close interpersonal coordination.
16. Recognize the value of human diversity.	Group discussions Team research and presentation projects.	Capstone project. Team members dependent on each other for success.
17. Demonstrate life management skills.	Performance responsibilities. Deadlines. Counseling sessions.	Capstone project. Project assignment requiring systematic orderly approach at management.

COLUMBUS STATE COMMUNITY COLLEGE
ASSESSMENT MATRIX ◆ CIVIL ENGINEERING TECHNOLOGY

STUDENT OUTCOMES	ENGL 101	MATH 135	ARCH 111	CMGT 121	CIVL 120	ENGL 102	MATH 148	CMGT 105	CIVL 121	CMGT 131	ARCH 112
1. Manually or with the assistance of computer aided drafting (CAD) prepare engineering drawings for public and private works projects.			F	F							F
2. Apply appropriate proportioning, mixing, placing, curing and admixtures to ensure quality structural concrete structures.		F			F				F		
3. Using ACI standards to correctly proportion concrete mixtures, design and detail simple structural concrete columns, beams, slabs and footings.		F		F					F		
4. Correctly apply regulatory and industry standards to design storm water management systems.	F										
5. Correctly apply regulatory and industry standards to design sanitary wastewater conveyance and treatment facilities.	F										
6. Perform all field operations to determine preliminary route alignment, prepare centerline and offset staking notes and stake a proposed project for finish grade complete with cut sheet.							F				
7. Correctly apply Ohio Department of Transportation (ODOT), Federal Highway Administration (FHWA) and industry design standards to plan, design and detail a simulated highway including drainage structures.							F				
8. Apply subdivision regulations and surveying laws in the preparation of preliminary sketch, preliminary plat and final plat for a major private land subdivision.							F				F
9. Perform preliminary site investigations, research infrastructure records, secure appropriate codes and regulations and prepare a set of preliminary drawings of an urban redevelopment site.					F	F	F		F		
10. Employ modern supervision techniques in field crew and work team settings.											
11. Perform quantity takeoffs for bid checking.				F						F	
12. Think critically.	F	F/S		F	F		F				F
13. Solve problems.		F/S	F						F	F	F
14. Communicate effectively.	F	F					F				
15. Demonstrate interpersonal skills.											
16. Recognize the value of human diversity.											
17. Demonstrate life management skills.		F					F				

COLUMBUS STATE COMMUNITY COLLEGE
ASSESSMENT MATRIX ♦ CIVIL ENGINEERING TECHNOLOGY

STUDENT OUTCOMES	GEOL 101 or PHYS 117	CPT 101	CMGT 106	SURV 141	CMGT 123	ENGL 204	COMM 105	CIVL 232	CMGT 125	SURV 241	CIVL 221
1. Manually or with the assistance of computer aided drafting (CAD) prepare engineering drawings for public and private works projects.		F									
2. Apply appropriate proportioning, mixing, placing, curing and admixtures to ensure quality structural concrete structures.	F										
3. Using ACI standards to correctly proportion concrete mixture, design and detail simple structural concrete columns, beams, slabs and footings.	F							F			
4. Correctly apply regulatory and industry standards to design storm water management systems.		F									F
5. Correctly apply regulatory and industry standards to design sanitary wastewater conveyance and treatment facilities.		F									F
6. Perform all field operations to determine preliminary route alignment, prepare centerline and offset staking notes and stake a proposed project for finish grade complete with cut sheet.										S	
7. Correctly apply Ohio Department of Transportation (ODOT), Federal Highway Administration (FHWA) and industry design standards to plan, design and detail a simulated highway including drainage structures.				F	F				F	F	
8. Apply subdivision regulations and surveying laws in the preparation of preliminary plat and final plat for a major private land subdivision.											
9. Perform preliminary site investigations research infrastructure records, secure appropriate codes and regulations and prepare a set of preliminary drawings of an urban redevelopment site.		F				F	F				
10. Employ modern supervision techniques in field crew and work team settings.			F	F					F		
11. Perform quantity takeoffs for bid checking.					F						
12. Use building construction standards, and codes to ensure the drawings comply with legal, safety and construction standards.											
13. Think critically.				F	F	F					
14. Solve problems.	F	F		F/S				F		F/S	F
15. Communicate effectively.		F				F	F				
16. Demonstrate interpersonal skills.				F							
17. Recognize the value of human diversity.											
18. Demonstrate life management skills.											

COLUMBUS STATE COMMUNITY COLLEGE
ASSESSMENT MATRIX ◆ CIVIL ENGINEERING TECHNOLOGY

STUDENT OUTCOMES	SSCI 10X	MCT 106	SURV 243	CIVL 223	SURV 245	HUM 1XX	SURV 247	SURV 249	XXX XXX
1. Manually or with the assistance of computer aided drafting (CAD) prepare engineering drawings for public and private works projects.		F						S	
2. Apply appropriate proportioning, mixing, placing, curing and admixtures to ensure quality structural concrete structures.									
3.a. Using ACI standards to correctly proportion concrete mixtures, design and detail simple structural concrete columns, beams, slabs and footings. 3.b. Use AISC standards		F/S							
4. Correctly apply regulatory and industry standards to design storm water management systems.		F		S					
5. Correctly apply regulatory and industry standards to design sanitary wastewater conveyance and treatment facilities.		F		S					
6. Perform all field operations to determine preliminary route alignment, prepare centerline and offset staking notes and stake a proposed project for finish grade complete with cut sheet.									
7. Correctly apply Ohio Department of Transportation (ODOT), Federal Highway Administration (FHWA) and industry design standards to plan, design and detail a simulated highway including drainage structures.			S		S				
8. Apply subdivision regulations and surveying laws in the preparation of preliminary sketch, preliminary plat and final plat for a major private land subdivision.					F		S	S	
9. Perform preliminary site investigations research infrastructure records, secure appropriate codes and regulations and prepare a set of preliminary drawings of an urban redevelopment site.		F	F		F		F	S	
10. Employ modern supervision techniques in field crew and work team settings.	F					F		S	
11. Perform quantity takeoffs for bid checking.									
12. Think critically.	F								
13. Solve problems.	F	F					F	F	
14. Communicate effectively.	F	F				F			
15. Demonstrate interpersonal skills.	F/S					F/S	F		
16. Recognize the value of human diversity.	F/S					F/S			
17. Demonstrate life management skills.									

Civil Engineering Technology
Methods of Formative and Summative Assessment
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Student Outcome	Methods of Formative Assessment	Methods of Summative Assessment
1. Manually or with the assistance of computer aided drafting (CAD) prepare engineering drawings for public and private works projects.	Lab performance and homework exercises preparing orthographic and isometric views complete with symbology. Lab performance on technology specific exercises including preparation of site plans, floor plans, mechanical and electrical schematics. Written and drafted quizzes and examinations.	Laboratory performance in a project team setting preparing working drawings, concept drawings, master plans, preliminary and final plats.
2. Apply appropriate proportioning, mixing, placing, curing and admixtures to ensure quality structural concrete structures.	Laboratory evaluation of material properties of concrete through both destructive and non-destructive ASTM testing procedures. Written quizzes and examinations.	Selection of appropriate concrete mixture to satisfy specific design parameters in a laboratory setting.
3. Using ACI standards to correctly proportion concrete mixtures, design and detail simple structural concrete columns, beams, slabs and footings.	Lab performance and homework exercises performing design calculations. Written quizzes and examinations.	Laboratory performance on a design basis.
4. Correctly apply regulatory and industry standards to design storm water management systems.	Written laboratory and homework exercises applying City of Columbus Standards in sizing storm water collection and retention facilities. Written quizzes and examinations.	Laboratory performance in a project team setting designing and detailing a storm water management system for a small residential subdivision.
5. Correctly apply regulatory and industry standards to design sanitary wastewater conveyance and treatment facilities.	Written laboratory and homework exercises applying Ohio EPA and Ten State Standards in sizing wastewater collection facilities. Written quizzes and examinations.	Laboratory performance in a project team setting selecting and sizing the appropriate unit processes to satisfy receiving stream water quality standards for a community of 12,000 population equivalent.

Civil Engineering Technology
Methods of Formative and Summative Assessment
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Student Outcome	Methods of Formative Assessment	Methods of Summative Assessment
6. Perform all field operations to determine preliminary route alignment, prepare centerline and offset staking notes and stake a proposed project for finish grade complete with cut sheet.	Written and field laboratory exercises emphasizing the use of modern surveying equipment techniques and procedures in an myriad of applications. Written examinations and field practical.	Laboratory performance in a project team setting collecting data, determining alignment, preliminary and final staking of a connecting road.
7. Correctly apply Ohio Department of Transportation (ODOT), Federal Highway Administration (FHWA) and industry design standards to plan, design and detail a simulated highway including drainage structures.	Written and laboratory exercises emphasizing the use of ODOT standards in determining horizontal and vertical alignment of highways. Written quizzes and examinations.	Laboratory performance in a project team setting in developing working drawings for a short highway project.
8. Apply subdivision regulations and surveying laws in the preparation of preliminary sketch, preliminary plat and final plat for a major private land subdivision.	Written laboratory and homework exercises applying federal government and Franklin County Standards in the subdivision of public and private lands. Written quizzes and examinations.	Laboratory performance in a project team setting in resolving conflicting deed and description information, performing research of public records, applying local regulations to prepare a preliminary and final subdivision plat.
9. Perform preliminary site investigations, research infrastructure records, secure appropriate codes and regulations and prepare a set of preliminary drawings of an urban development/redevelopment site.	Written laboratory, research and homework exercises applying accepted industry and local planning techniques to a myriad of situations. Written quizzes.	Laboratory performance in a project team setting applying planning and design concepts to a specific community/college project. Formal presentation to a community/college panel is included in the process.
10. Employ modern supervision techniques in field crew and work team settings.	Written classroom and homework exercises. Written quizzes and examinations.	Observations of individuals during the performance of projects in team settings. Emphasis on team building, setting and fulfilling deadlines.

Civil Engineering Technology
Methods of Formative and Summative Assessment
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Student Outcome	Methods of Formative Assessment	Methods of Summative Assessment
14. Think critically.	Planning, selecting correct equipment, applying industry standard procedures, and executing laboratory assignments. Assessment tools include performance on laboratory exercises.	Laboratory performance in a project team setting selecting appropriate codes and standards, assign tasks, select team members, establish deadlines and prepare working drawings for a community/college projects.
15. Solve problems.	Written laboratory, research and homework exercises including conceptual, situational, numerical and graphic solutions. Assessment tools include written quizzes, oral, graphic and written exercises and written tests.	Laboratory performance in a team setting applying industry codes and standards to solve a community/college problem.
16. Communicate effectively.	Written, graphic, oral and media (slide/tape) presentations outlining testing, installation and application methods and procedures intrinsic to the construction industry. Use of technical terms and concepts used in the construction industry. Assessment tools include laboratory projects, original and/or media research, quizzes and tests.	Individual and team laboratory performance in making presentations outlining a construction technique, procedure, testing method and/or solution to a community/college problem.
17. Demonstrate interpersonal skills.	Perform original research, laboratory assignments and presentations in a cooperative project team setting. Assessment tools include actual performance of assignments within the specified deadline times.	Project team laboratory performance in setting goals, establishing priorities, developing schedules and assigning tasks in simulated work (industry) environment. Team building, leadership and cooperative effort are assessed through team performance on production projects.

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Student Outcome	Methods of Formative Assessment	Methods of Summative Assessment
18. Recognize the value of human diversity.	Research, written exercises, quizzes and written examinations concerning contributions by and trends of "non-traditional" groups in the construction industry.	Laboratory performance in a team setting recognizing the strengths of each team member and the contribution of each team member toward a common goal.
19. Demonstrate life management skills.	Research, written exercises, quizzes, reference notebooks, and written examinations concerning career decisions, responsibilities and opportunities within the construction industry.	Laboratory performance in a team setting to set goals, establish deadlines and allocate and manage time on a common project.

COLUMBUS STATE COMMUNITY COLLEGE
ASSESSMENT MATRIX ◆ CONSTRUCTION MANAGEMENT TECHNOLOGY

STUDENT OUTCOMES	ENGL 101	CMGT 101	CMGT 121	CMGT 105	CMGT 115	CMGT 123	ENGL 102	MATH 104	CMGT 131	CMGT 106	CPT 101
1. Analyze and interpret all types of construction drawings and documents.	F	F	F	F	F	F	F	F	F	F	
2. Calculate quantities of material, labor, and equipment needed for a project.	F		F			F		F	F		
3. Analyze financial data relative to construction work in the field and office.		F						F			
4. Control field operations through cost analysis and productivity analysis.											
5. Apply data analysis to identify construction problems, specify goals, and execute projects.		F								F	
6. Utilize the critical path and Gantt bar chart methods to organize complex construction projects.		F		F						F	
7. Identify and understand the major elements in construction labor and contract law.		F		F						F	
8. Operate and use microcomputers, pre-packaged project management software, 35 mm camera, scan machine and time-lapse projector.			F			F			F		
9. Stake out control points for projects using modern laser surveying equipment.											
10. Assist in developing marketing tools and objectives to increase the sales of no-bid jobs for their employers.		F									
11. Assist in purchasing or safety/loss control of equipment and materials.		F		F	F	F			F	F	
12. Apply bid strategies to marketing proposals for building and heavy construction type projects.		F				F			F		
13. Assist in resolving construction disputes, claims and arbitration/litigations.	F	F		F	F		F			F	
14. Think critically.	F		F			F	F	F/S			
15. Solve problems.		F		F	F			F/S	F	F	F
16. Communicate effectively.	F						F	F			
17. Demonstrate interpersonal skills.		F								F	
18. Recognize the value of human diversity.											
19. Demonstrate life management skills.								F			

COLUMBUS STATE COMMUNITY COLLEGE
ASSESSMENT MATRIX ♦ CONSTRUCTION MANAGEMENT TECHNOLOGY

STUDENT OUTCOMES	CMGT 125	MTH 148	CMGT 135	CMGT 141	CIVL 120	MCT 106	MATH 135	CMGT 248	CMGT 241	CMGT 243	SURV 141
1. Analyze and interpret all types of construction drawings and documents.				S				S			
2. Calculate quantities of material, labor, and equipment needed for a project.	F	F		S	F		F	S	S		
3. Analyze financial data relative to construction work in the field and office.	F	F	F	S	F		F	S	S	S	
4. Control field operations through cost analysis and productivity analysis.	F	F	F	S	F		F	S	S		
5. Apply data analysis to identify construction problems, specify goals, and execute projects.			F	S				S	S	S	
6. Utilize the critical path and Gantt bar chart methods to organize complex construction projects.									S		
7. Identify and understand the major elements in construction labor and contract law.			F							S	
8. Operate and use microcomputers, pre-packaged project management software, time-lapse video camera, 35 mm camera, scan machine and time-lapse projector.	F			S		F		S	S		
9. Stake out control points for projects using modern laser surveying equipment.		F					F				S
10. Assist in developing marketing tools and objectives to increase the sales of no-bid jobs for their employers.											
11. Assist in purchasing or safety/loss control of equipment and materials.			S						S		
12. Apply bid strategies to marketing proposals for building and heavy construction type projects.		F		S		F	F	S	S		
13. Assist in resolving construction disputes, claims and arbitration/litigations.										S	
14. Think critically.		F/S	F				F/S			F	
15. Solve problems.	F	F/S	F	F	F		F/S	F	F		F
16. Communicate effectively.		F				F	F		F		
17. Demonstrate interpersonal skills.										F	
18. Recognize the value of human diversity.											
19. Demonstrate life management skills.		F					F				

COLUMBUS STATE COMMUNITY COLLEGE
ASSESSMENT MATRIX ◆ CONSTRUCTION MANAGEMENT TECHNOLOGY

STUDENT OUTCOMES	HUM 1XX	CMGT 251	CMGT 252	CMGT 253	CMGT 231	COMM 105	SSCI 10X	ENGL 200	CMGT 261	CMGT 263	SURV 241
1. Analyze and interpret all types of construction drawings and documents.		S	S			F		F	S	S	S
2. Calculate quantities of material, labor, and equipment needed for a project.		S			F				S		
3. Analyze financial data relative to construction work in the field and office.		S			F				S	S	
4. Control field operations through cost analysis and productivity analysis.		S			F				S		
5. Apply data analysis to identify construction problems, specify goals, and execute projects.		S		F					S	S	
6. Utilize the critical path and Gantt bar chart methods to organize complex construction projects.		S							S	S	
7. Identify and understand the major elements in construction labor and contract law.			S						S	S	
8. Operate and use microcomputers, pre-packaged project management software, 35 mm camera, scan machine and time-lapse projector.		S			S				S	S	S
9. Stake out control points for projects using modern laser surveying equipment.											S
10. Assist in developing marketing tools and objectives to increase the sales of no-bid jobs for their employers.				F					S	S	
11. Assist in purchasing or safety/loss control of equipment and materials.		S		F	F				S		
12. Apply bid strategies to marketing proposals for building and heavy construction type projects.		S		F	S				S	S	
13. Assist in resolving construction disputes, claims and arbitration/litigations.											
14. Think critically.		F		F	S		F	F	F		
15. Solve problems.		F		F	F		F		F	F	F
16. Communicate effectively.	F	F		F		F	F	F	F		
17. Demonstrate interpersonal skills.	F/S	F		F			F/S		F		
18. Recognize the value of human diversity.	F/S						F/S				
19. Demonstrate life management skills.				F							

COLUMBUS STATE COMMUNITY COLLEGE

ASSESSMENT MATRIX ◆ CIVIL ENGINEERING TECHNOLOGY

STUDENT OUTCOMES	ENGL 101	MATH 135	ARCH 111	CMGT 121	CIVL 120	ENGL 102	MATH 148	CMGT 105	CIVL 121	CMGT 131	ARCH 112
1. Manually or with the assistance of computer aided drafting (CAD) prepare engineering drawings for public and private works projects.			F	F							F
2. Apply appropriate proportioning, mixing, placing, curing and admixtures to ensure quality structural concrete structures.		F			F				F		
3. Using ACI standards to correctly proportion concrete mixtures, design and detail simple structural concrete columns, beams, slabs and footings.		F		F					F		
4. Correctly apply regulatory and industry standards to design storm water management systems.	F										
5. Correctly apply regulatory and industry standards to design sanitary wastewater conveyance and treatment facilities.	F										
6. Perform all field operations to determine preliminary route alignment, prepare centerline and offset staking notes and stake a proposed project for finish grade complete with cut sheet.							F				
7. Correctly apply Ohio Department of Transportation (ODOT), Federal Highway Administration (FHWA) and industry design standards to plan, design and detail a simulated highway including drainage structures.							F				
8. Apply subdivision regulations and surveying laws in the preparation of preliminary sketch, preliminary plat and final plat for a major private land subdivision.							F				F
9. Perform preliminary site investigations, research infrastructure records, secure appropriate codes and regulations and prepare a set of preliminary drawings of an urban redevelopment site.					F	F	F		F		
10. Employ modern supervision techniques in field crew and work team settings.											
11. Perform quantity takeoffs for bid checking.				F						F	
12. Think critically.	F	F/S		F	F		F				F
13. Solve problems.		F/S	F						F	F	F
14. Communicate effectively.	F	F					F				
15. Demonstrate interpersonal skills.											
16. Recognize the value of human diversity.											
17. Demonstrate life management skills.		F					F				

Construction Management Technology
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Student Outcome	Methods of Formative Assessment	Methods of Summative Assessment
1. Analyze and interpret all types of construction drawings and documents.	Lab performances. Assignments. Intern experience. Written/practical exams.	Lab performance and final exam over set of drawings and specifications manual.
2. Calculate quantities of material, labor, and equipment needed for a project.	Lab performances. Assignments. Tests and quizzes. Intern experience. Lab performance in estimating.	Written exam. Lab performance on quantifying and estimating a set of drawings.
3. Analyze financial data relative to construction work in the field and office.	Lab performances. Assignments. Intern experience. Tests and quizzes.	Exam. Project submittal with project schedule and cost identified.
4. Control field operations through cost analysis and productivity analysis.	Intern experiences. Tests and quizzes. Lab performances. Computer costing on schedule.	Exam. Project submittal with schedule and costs identified.
5. Apply data analysis to identify construction problems, specify goals, and execute projects.	Intern experiences. Lab performances. Tests and quizzes. Assignments.	Exam.
6. Utilize the critical path and Gantt bar chart methods to organize complex construction projects.	Intern experiences. Lab performances on computer. Tests and quizzes. Computer scheduling.	Exam. Project with fenced bar chart done through Primavera scheduling.
7. Identify and understand the major elements in construction labor and contract law.	Test and quizzes. Assignments. In class projects.	Exam.
8. Operate and use microcomputers, pre-packaged project management software, 35 mm camera, scan machine and time-lapse projector.	Lab performances. Computer usage. 35mm camera usage.	Major project due on productivity and scheduling of construction projects.
9. Stake out control points for projects using modern laser surveying equipment.	Lab performances utilizing laser equipment. Tests and quizzes. Intern experience. Class assignment.	Exam. Final lab practicum. Lab performance.

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Student Outcome	Methods of Formative Assessment	Methods of Summative Assessment
10. Assist in developing marketing tools and objectives to increase the sales of no-bid jobs for their employers.	In-class projects. Use of 35mm camera for project. Tests and quizzes.	Major slide project presentation in written and oral format. Exam.
11. Assist in purchasing or safety/loss control of equipment and materials.	In-class presentations. Tests and quizzes. Assignments. Intern experiences.	Exam. Lab performance.
12. Apply bid strategies to marketing proposals for building and heavy construction type projects.	Lab performance in estimating. Assignments in take-off and costing projects. Tests and quizzes.	Exam. Lab performances.
13. Assist in resolving construction disputes, claims and arbitration/litigations.	Tests and quizzes. Assignments. In-class projects.	Exam. Lab performances.
14. Think critically	Written exercises. Negotiations problems. Short answer and essay quizzes.	Exam with essay questions with critical thinking and problem solving techniques being used.
15. Solve problems.	Labor and contract negotiation oral and written exercises. Supervisory problem solving exercise questions.	Exam using essay type questions with problem solving techniques.
16. Communicate effectively.	Class participation through the use of oral communications. Written communication exercises.	Exam using short answers, essay questions, and oral questions.
17. Demonstrate interpersonal skills.	Class team projects in various subject matter with leaders and group members learning to work with each other.	Exam Final lab practicum on a team basis.
18. Recognize the value of human diversity.	Team projects with various diverse members on each team.	Exam through final lab practicum done on diverse team basis.
19. Demonstrate life management skills.	Team leaders and group members working on various class projects.	Exam through final lab practicum done with leaders and group members.

COLUMBUS STATE COMMUNITY COLLEGE
ASSESSMENT MATRIX ♦ HEATING & AIR CONDITIONING TECHNOLOGY

STUDENT OUTCOMES	ENGL 101	CPT 101	ARCH 111	HAC 141	HAC 183	ENGL 102	MATH 104	HAC 112	HAC 161	HAC 284	ENGL 200
1. Create manual and computer graphic representations of HVAC projects.		F	F	F	F	F	F	F		S	F
2. Select piping materials and design piping systems.				F		F	F	F	F		
3. Be able to perform designs for commercial and industrial piping systems, including water, steam and refrigeration piping.				F		F	F	F			F
4. Calculate heat loss and heat gain loads for residential and commercial structures, using National ACCA manuals and computer software.		F		F				F	F		
5. Use testing and analyzing instruments, calculate combustion process for various fuels (e.g., natural gas, coal, and fuel oil) to ensure proper operation for the most efficient operation of boilers and furnaces.				F	F	F		F	F	F	
6. Assist in the selection and application of various residential and commercial HVAC equipment to solve environmental problems.				F	F			F	F	F	
7. Assist in the design and automatic control circuits using electromechanical and electronic control devices.					F	F		F			
8. Assist in designing preventative maintenance programs for various HVAC systems.											
9. Research and apply local, state and national codes to various environmental systems.				F	F			F	F		
10. Assist in conducting energy audits of residential and commercial structures.											
11. Test and calculate air flow through system equipment.											
12. Read control schematics and test control circuits for malfunctions.					F					S	
13. Troubleshoot and repair gas/electric furnaces, fuel oil furnaces, split system air conditioners and heat pumps, humidifiers and electronic air cleaners.										F	
14. Think critically.				F	F		F	F	F	F	
15. Solve problems.				F	F		F	F	F	F	
16. Communicate effectively.				F	F	F	F	F	F	F	F
17. Demonstrate interpersonal skills.				F	F	F	F	F	F	F	F
18. Recognize the value of human diversity.				F	F	F	F	F	F	F	
19. Demonstrate life management skills.				F	F	F	F	F	F	F	F

COLUMBUS STATE COMMUNITY COLLEGE
ASSESSMENT MATRIX ♦ HEATING & AIR CONDITIONING TECHNOLOGY

STUDENT OUTCOMES	MATH 148	HAC 152	ARCH 112	HAC 222	EET 101	COMM 105	HAC 253	HAC 231	HAC 254	EET 102	HAC 244
1. Create manual and computer graphic representations of HVAC projects.			S				F				F
2. Select piping materials and design piping systems.	F	F					F		S		F
3. Be able to perform designs for commercial and industrial piping systems, including water, steam and refrigeration piping.		F					F	S			F
4. Calculate heat loss and heat gain loads for residential and commercial structures, using National ACCA manuals and computer software.	F	F		F				F			F
5. Use testing and analyzing instruments, calculate combustion process for various fuels (e.g., natural gas, coal, and fuel oil) to ensure proper operation for the most efficient operation of boilers and furnaces.	F	S		F				F		F	S
6. Assist in the selection and application of various residential and commercial HVAC equipment to solve environmental problems.		F		S			F	S		F	F
7. Assist in the design and automatic control circuits using electromechanical and electronic control devices.		F					F			F	S
8. Assist in designing preventative maintenance programs for various HVAC systems.		F					F				S
9. Research and apply local, state and national codes to various environmental systems.		F		F		F	F	F			F
10. Assist in conducting energy audits of residential and commercial structures.	F	F									F
11. Test and calculate air flow through system equipment.		F		F				F	S		S
12. Read control schematics and test control circuits for malfunctions.							F				S
13. Troubleshoot and repair gas/electric furnaces, fuel oil furnaces, split system air conditioners and heat pumps, humidifiers and electronic air cleaners.		F					F		S		S
14. Think critically.		F	F	F	F			F	F	F	F
15. Solve problems.	F	F						F	F		F
16. Communicate effectively.		F				F		F	F		
17. Demonstrate interpersonal skills.											
18. Recognize the value of human diversity.											
19. Demonstrate life management skills.						F					

COLUMBUS STATE COMMUNITY COLLEGE
ASSESSMENT MATRIX ♦ HEATING & AIR CONDITIONING TECHNOLOGY

STUDENT OUTCOMES	HAC 256	HAC 242	SSCI 10X	HAC 243	HUM 1XX	HAC 2XX	HAC 266	CIVL 120
1. Create manual and computer graphic representations of HVAC projects.	S			F			S	F
2. Select piping materials and design piping systems.		F		F			S	
3. Be able to perform designs for commercial and industrial piping systems, including water, steam and refrigeration piping.	F			F			S	
4. Calculate heat loss and heat gain loads for residential and commercial structures, using National ACCA manuals and computer software.				F			S	
5. Use testing and analyzing instruments, calculate combustion process for various fuels (e.g., natural gas, coal, and fuel oil) to ensure proper operation for the most efficient operation of boilers and furnaces.	F			S			S	
6. Assist in the selection and application of various residential and commercial HVAC equipment to solve environmental problems.	F	F		F			S	
7. Assist in the design and automatic control circuits using electromechanical and electronic control devices.	S	F		S			S	
8. Assist in designing preventative maintenance programs for various HVAC systems.				S			S	F
9. Research and apply local, state and national codes to various environmental systems.	F	S		F			S	F
10. Assist in conducting energy audits of residential and commercial structures.							S	F
11. Test and calculate air flow through system equipment.				S			S	
12. Read control schematics and test control circuits for malfunctions.	S			S			S	
13. Troubleshoot and repair gas/electric furnaces, fuel oil furnaces, split system air conditioners and heat pumps, humidifiers and electronic air cleaners.	F	F		S			S	
14 Think critically.	F	F		F			S	F
15. Solve problems.	F			F			S	F
16. Communicate effectively.		F		F			S	
17. Demonstrate interpersonal skills.			F				S	
18. Recognize the value of human diversity.			F				S	
19. Demonstrate life management skills.			F				S	

COLUMBUS STATE COMMUNITY COLLEGE
ASSESSMENT MATRIX ♦ ARCHITECTURE TECHNOLOGY

STUDENT OUTCOMES	ARCH 113	BMGT 111	LAND 152	ARCH 155	CIVL 232	ARCH 250	ARCH 212	ARCH 232	ARCH 262	ARCH 112
1. Create manual and computer graphic representations of orthographic and isometric projections.	F/S			F		F	F		S	F
2. Use geometry to solve problems with areas and intersecting surfaces and lines.	F/S		F/S	F						
3. Work with one- and two-point perspectives, shades and shadows, and free-hand drawing techniques to express relevant ideas graphically.									F/S	
4. Generate and organize schedules and details within a complete set of architectural working drawings.				F		F				
5. Research materials, consult with industry experts, and use CSI standards to create a set of specifications to support the architectural drawings.				F		F/S		F		
6. Read and interpret information from architectural drawings for the estimating and bidding process.			F	F		F	F			F
7. Use building construction standards and codes to ensure that architectural drawings comply with legal and safety guidelines.				F		F	F	S		
8. Assist the architect in solving and drawing structural details by referring to information on statics/strength of materials, basic knowledge of wood structures, and steel and concrete hand books/reference materials.				F/S	F	F				
9. Create isometric layouts of basic mechanical systems employed in commercial buildings.							F/S			
10. Recognize and understand architectural style and historical heritage.				F						
11. Develop site plan layouts.	F		F/S							
12. Think critically.			F				F		F	F
13. Solve problems.	F	F	F	F	F	F	F		F	F
14. Communicate effectively.									F	
15. Demonstrate interpersonal skills.			F							
16. Recognize the value of human diversity.										
17. Demonstrate life management skills.										

F=FORMATIVE ASSESSMENT

S=SUMMATIVE ASSESSMENT

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Student Outcome	Methods of Formative Assessment	Methods of Summative Assessment
1. Create manual and computer graphic representations of HVAC projects.	Using lab performance and homework exercises for manually producing orthographic and isometric views of related Heating and Air Conditioning equipment, along with appropriate HVAC symbology. Using lab performance and homework exercises for generating computer based drawings using both isometric and orthographic projections. Written and computed drafted quizzes, with mid-term and final exams. (CPT101, ARCH111, HAC253, HAC244, HAC141, HAC183, HAC112, ENGL102, MATH 104, ENGL200, and CIVL120)	Lab projects producing finished mechanical drawings using both isometric and orthographic projections. Written and equipment usage tests. (HAC 284 and ARCH 112)
2. Select piping materials and design piping systems.	Select appropriate related piping material for the individual job based on type of fluid, installation requirements, and environment. (HAC161, ENGL102, MATH104, MATH148, HAC152, HAC253, HAC244, HAC141 AND HAC112) Written tests.	Select materials and joining methods required to complete application requirements for HAC commercial and industrial piping systems. (HAC254) Written tests.

Student Outcome	Methods of Formative Assessment	Methods of Summative Assessment
3. Be able to perform designs for commercial and industrial piping systems, including water, steam and refrigeration piping.	Researching and selecting proper piping material to be applied to various HAC job applications. Researching and selecting proper valve usage for application into commercial and industrial piping systems. Evaluation of proper joining methods required for steel pipe, plastic pipe and metal tubing. Written quizzes, with mid-term and final exams. (HAC141, ENGL102, MATH104, HAC112, ENGL200, HAC152, HAC253 and HAC244)	Select materials from manufacturer's literature and determine proper joining methods required to complete application requirements for HAC commercial and industrial piping systems. (HAC231) Written tests.
4. Calculate heat loss and heat gain loads for residential and commercial structures, using National ACCA manuals and computer software.	Evaluation of heat loss/heat gain principles of a building. Perform heat loss/heat gain calculations to determine proper heating/cooling equipment and duct sizing and energy costs. (CPT101, HAC141, HAC112, HAC161, MATH148, HAC152, HAC222, HAC231 and HAC244) Written quizzes, with mid-term and final exams.	From manufacturers literature select proper equipment based on calculated heat loss/heat gain and fuel availability and product cost. Classroom projects on Manual J.

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Student Outcome	Methods of Formative Assessment	Methods of Summative Assessment
5. Use testing and analyzing instruments, calculate combustion process for various fuels (e.g., natural gas, coal, and fuel oil) to ensure proper operation for the most efficient operation of boilers and furnaces.	Laboratory projects for the evaluation of combustion properties and principles of natural gas and fuel oil. Lab projects using combustion analyzing equipment, fuel measuring equipment and test instruments to determine and calculate the combustion efficiency of various fuels. Written quizzes, lab projects, with mid-term and final exams. (ARCH111, HAC141, HAC183, MATH104, HAC161, HAC284, MATH148, HAC222, HAC253 and EET102.	Perform combustion testing on combustion by-products to include CO, CO^2, smoke, draft, and stack temperature to determine combustion efficiency. Summarize test results and apply necessary steps to further enhance performance. Written tests. (HAC152 and HAC244)
6. Assist in the selection and application of various residential and commercial HVAC equipment to solve environmental problems.	Laboratory exercises selecting from manufacturer's engineering data sheets, appropriate equipment that will fulfill the requirements for fuel, air flow parameters, and installation configuration. Interpret building codes applications for correct equipment installations. Written quizzes, lab projects, with mid-term and final exams. (HAC141, HAC183, MATH104, HAC112, HAC161, HAC152, HAC253, EET101, and HAC244)	Select equipment and materials, check for compliance with city and state building regulations. Interview manufacturer's representatives about product application and efficiency. HAC222 and HAC231. Written exams.

Student Outcome	Methods of Formative Assessment	Methods of Summative Assessment
7. Assist in the design and automatic control circuits using electro mechanical and electronic control devices.	Laboratory evaluation of various relays, contactors, and switches that comprise electro-mechanical and electronic systems. Performance on various lab assignments to include selection, code application, inventory control and price. Written quizzes, lab projects, with mid-term and final exams. (HAC183, ENGL102, MATH104, HAC152, and HAC253)	Lab exercises using HVAC controls to simulate industry related control circuitry and application. Written tests and equipment usage tests. (HAC256 and HAC244)
8. Assist in designing preventative maintenance programs for various HVAC systems.	Laboratory projects laying out various pieces of equipment and creating appropriate preventative maintenance schedules. Read and interpret state and national energy codes to evaluate conditions and recommend corrective action. Written quizzes, lab projects, with mid-term and final. (HAC152, HAC253, and CIVL120)	Creating formal client type presentations including artwork, PM maintenance forms and equipment feasibility forms. Final project assignment. (HAC244)
9. Research and apply local, state and national codes to various environmental systems.	Interpret ASHRAE, NFPA, NEC, EPA and SMACNA code application and write specific requirements for state and local application. Various lab exercises and worksheets with mock situations applying to interpretation. Written quizzes, lab projects, with mid-term and final. (HAC141, HAC183, HAC112, HAC161, HAC152, HAC222, COMM105, HAC253, HAC231, HAC244, and CIVL120)	Lab exercises using NFPA association standards to determine viability of a simulated HAC installation. Written and oral presentations. None. (HAC242)

Student Outcome	Methods of Formative Assessment	Methods of Summative Assessment
10. Assist in conducting energy audits of residential and commercial structures.	Perform combustion efficiency and electrical calculations on operating equipment. Draft proposals for corrective action plans. Written quizzes, lab projects, with mid-term and final. (MATH148, HAC152, HAC244, and CIVL120)	Lab exercises using industry standard forms and reports to determine appropriate means of improvement. Final presentations.
11. Test and calculate air flow through system equipment.	Perform lab exercises relating to air moving parameters, fans laws, specific density and gas laws on various pieces of air moving equipment. Perform fan law calculations. Written quizzes, lab projects, with mid-term and final. (HAC152, HAC222 and HAC231)	Lab exercises using manometers, combustion efficiency analyzer temperature probes and combustion charts to ascertain equipment performance. Written and equipment usage testing. (HAC254 and HAC244)
12. Read control schematics and test control circuits for malfunctions.	Lab exercises relating to interpretation of pictorial, installation and schematic wiring diagrams. Selecting components needed for creating various environmental control systems. Lab exercises relating to the actual wiring of various schematic wiring circuits. Written quizzes, lab projects, with mid-term and final. (HAC183 and HAC253)	Select materials from various manufacturer's to meet the needs of the application. Create schematic wiring diagrams to fulfill the needs of the environmental equipment. Written and equipment usage testing. (HAC254 and HAC244)

Student Outcome	Methods of Formative Assessment	Methods of Summative Assessment
13. Troubleshoot and repair gas/electric furnaces, fuel oil furnaces, split system air conditioners and heat pumps, humidifiers and electronic air cleaners.	Laboratory projects evaluating combustion efficiencies. Laboratory projects evaluating air moving parameters. Laboratory exercises to interpret control function and design. Perform written assignments to read and interpret schematic wiring diagrams. Written quizzes, lab projects, with mid-term and final. (HAC284, HAC152 and HAC253)	Select appropriate meters and test equipment needed to perform combustion, electrical and air moving tests. Perform lab exercises to simulate industry standards. (HAC254 and HAC244) Written and equipment usage testing. Select.

Student Outcome	Methods of Formative Assessment	Methods of Summative Assessment
14. Think critically.	Select various and appropriate testing equipment for the individual piece of equipment or task. Interpret national, state and local codes for correct application and installation. Using lab performance and previous knowledge to determine stated outcomes for different applications. Evaluation of proper fact finding methodology procedures. Written quizzes, lab projects, with mid-term and final exams. (HAC141, HAC183, MATH104, HAC112, HAC161, HAC284, HAC152, ARCH112, HAC222, EET101, HAC231, HAC254, EET102, HAC244, HAC256, HAC242, HAC243, ARCH120, and CIVL120)	Lab exercises using indicated code consideration, application parameters, and customer relations. Written test, oral and equipment usage tests. (HAC266)

Student Outcome	Methods of Formative Assessment	Methods of Summative Assessment
15. Solve problems.	Select various and appropriate testing equipment for the individual piece of equipment or task. Using lab performance and previous knowledge to determine stated outcomes for different HAC equipment applications. Evaluation of proper fact finding methodology procedures. Summarize lab test results. Written quizzes, lab projects, with mid-term and final exams. (HAC141, HAC183, MATH104, HAC112, HAC161, HAC284, HAC152, ARCH112, HAC222, EET101, HAC231, HAC254, EET102, HAC244, HAC256, HAC242, HAC243, ARCH120, and CIVL120)	Lab exercises using indicated code consideration, application parameters, and customer relations. Written test, oral and equipment usage tests. (HAC266)

Student Outcome	**Methods of Formative Assessment**	**Methods of Summative Assessment**
16. Communicate effectively.	Draft proposals, action plans, company policy manuals, and company correspondence for acceptance. Evaluation of assigned homework for both technical and grammatical errors. Lab and lecture exercises used to communicate through the use of interpretive symbology used in this industry. Written quizzes, lab projects, with mid-term and final exams. (HAC141, HAC183, ENGL102, MATH104, HAC112, HAC161, HAC284, ENGL200, HAC152, COMM105, HAC231, HAC254, HAC242, and HAC243)	Lab exercises using HAC electrical control, piping and wiring symbols to simulate industry related standards. Written tests and equipment usage tests. Final report and oral presentation. (HAC266)

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Methods of Formative and Summative Assessment
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Student Outcome	Methods of Formative Assessment	Methods of Summative Assessment
17. Demonstrate Interpersonal Skills	Using lab exercises, reading and homework assignments to evaluate personality traits. Establishing time lines for completion of necessary work. Written quizzes, lab projects, with mid-term and final exams. (SSCI10X)	Grouping students together for the performance of different lab exercises. Establishing "Team Leaders" for various tasks. Creating and atmosphere for the student to "express" themselves. Written quizzes, lab projects, with mid-term and final exams. (HAC266)
18. Recognize the value of human diversity.	Lab exercises to reflect "situational relations." Lab exercises relating to "Culture Diversity" and "Customer Relations." Create "mock" job interview skill presentations. Written quizzes, lab projects, with mid-term and final exams. (SSCI10X)	Creating an atmosphere where everyone is the same, yet understanding individual differences. Final presentations and oral reports. (HAC266)
19. Demonstrate life management skills.	Using lab and classroom exercises that relate to previous employment. Use student's field experience to enhance the depth of classroom material. Understand each and everyone's ability and what they have achieved so far. Written quizzes, lab projects, with mid-term and final exams. (SSCI10X)	Recognize and make allowances for various segments of our society. Assign written projects for them to relate to life's experiences. Interview students so that fellow students can also learn form them. Final presentations and oral reports. (HAC266)

COLUMBUS STATE COMMUNITY COLLEGE
ASSESSMENT MATRIX ♦ LANDSCAPE MAJOR

STUDENT OUTCOMES	ENGL 101	ARCH 111	LAND 101	MATH 104	CPT 101	CHEM 100	CIVL 120	LAND 102	MATH 148	ENGL 102
1. Assist in the preparation of contract/design documents and construction specifications.		F	F	F	F		F	F	F	F
2. Assist landscape professionals in managing and implementing the construction process.			F				F	F	F	F
3. Select suitable herbaceous and woody plants and properly install the same.										
4. Estimate landscape project costs by utilizing take-off and costing methods.					F			F	F	
5. Be able to interpret plans and drawings.		F	F				F	F		
6. Assist in the survey and stake out of the job site.										
7. Create manual and/or computer generated drawings of landscape projects.					F					
8. Prepare presentation drawings using a variety of graphic techniques.				F	F			F	F	
9. Maintain both commercial and residential landscapes.										
10. Design and install irrigation systems										
Think critically.				F/S	F				F/S	F
12. Solve problems.		F	F	F/S	F	F		F	F/S	
13. Communicate effectively.	F			F					F	F
14. Demonstrate interpersonal skills.										
15. Recognize the value of human diversity.										
16. Demonstrate life management skills.				F					F	

BEST COPY AVAILABLE

F = FORMATIVE ASSESSMENT S = SUMMATIVE ASSESSMENT

COLUMBUS STATE COMMUNITY COLLEGE
ASSESSMENT MATRIX ♦ LANDSCAPE MAJOR

STUDENT OUTCOMES	BIO 125	LAND 107	LAND 105	LAND 152	LAND 207	LAND 205	LAND 206	ARCH 291	LAND 108	ENGL 204
1. Assist in the preparation of contract/design documents and construction specifications.		F	F	F	F	F	F	F/S	F	F
2. Assist landscape professionals in managing and implementing the construction process.		F	F	F	F	F		F/S	F	F
3. Select suitable herbaceous and woody plants and properly install the same.	F		F/S			F/S		F/S	F/S	
4. Estimate landscape project costs by utilizing take-off and costing methods.				F	F/S			F/S		
5. Be able to interpret plans and drawings.				F/S	F			F/S		
6. Assist in the survey and stake out of the job site.					F			F/S		
7. Create manual and/or computer generated drawings of landscape projects.				F/S	F					
Prepare presentation drawings using a variety of graphic techniques.				F	F/S		F/S	F/S		
9. Maintain both commercial and residential landscapes.		F/S						F/S		
10. Design and install irrigations systems.										
11. Think critically		F		F	F			F		F
12. Solve problems.	F	F		F/S	F		F	F		
13. Communicate effectively.		F		F/S	F		F	F		F
14. Demonstrate interpersonal skills.				F/S	F			F		
15. Recognize the value of human diversity.								F		
16. Demonstrate life management skills.								F		

F = FORMATIVE ASSESSMENT S = SUMMATIVE ASSESSMENT

COLUMBUS STATE COMMUNITY COLLEGE
ASSESSMENT MATRIX ◆ LANDSCAPE MAJOR

STUDENT OUTCOMES	COMM 105	HUM 1XX	LAND 202	LAND 222	SSCI 10X	SURV 141	LAND 201	LAND 203	XXX XXX
1. Assist the landscape architect or the landscape contractor in designing the landscape project.	F	F/S		F				F	
2. Assist the Landscape Architect of the Landscape Contractor in controlling the construction process.			F/S	F/S		F		F	
3. Select landscape plants suitable for specific landscape situations.			S	F			F		
4. Estimate landscape projects costs by utilizing take-off and costing processes.			F	F/S					S
5. Be able to read and interpret information from landscape drawings.			F	F				F	F/S
6. Assist in survey and stake out of the job site.						F/S			
7. Create manual and computer graphic representations of orthographic and isometric landscape projects.									
8. Work with perspectives, shades and shadows, and free-hand drawing techniques to express relevant ideas graphically.			F/S						
9. Maintain both commercial and residential landscapes.							F		
[illegible] Design and install irrigation systems.									
11. Think critically.			F	F	F		F		
12. Solve problems.			F/S	F/S	F		F/S	F	
13. Communicate effectively.	F/S	F	F	S	F				
14. Demonstrate interpersonal skills.		F/S		S	F/S				
15. Recognize the value of human diversity.		F/S			F/S				
16. Demonstrate life management skills.									

F = FORMATIVE ASSESSMENT S = SUMMATIVE ASSESSMENT

COLUMBUS STATE COMMUNITY COLLEGE
ASSESSMENT MATRIX ◆ ARCHITECTURE TECHNOLOGY

STUDENT OUTCOMES	ARCH 113	BMGT 111	LAND 152	ARCH 155	CIVL 232	ARCH 250	ARCH 212	ARCH 232	ARCH 262	ARCH 112
1. Create manual and computer graphic representations of orthographic and isometric projections.	F/S			F		F	F		S	F
2. Use geometry to solve problems with areas and intersecting surfaces and lines.	F/S		F/S	F						
3. Work with one- and two-point perspectives, shades and shadows, and free-hand drawing techniques to express relevant ideas graphically.									F/S	
4. Generate and organize schedules and details within a complete set of architectural working drawings.				F		F				
5. Research materials, consult with industry experts, and use CSI standards to create a set of specifications to support the architectural drawings.				F		F/S		F		
6. Read and interpret information from architectural drawings for the estimating and bidding process.			F	F		F	F			F
7. Use building construction standards and codes to ensure that architectural drawings comply with legal and safety guidelines.				F		F	F	S		
8. Assist the architect in solving and drawing structural details by referring to information on statics/strength of materials, basic knowledge of wood structures, and steel and concrete hand books/reference materials.				F/S	F	F				
9. Create isometric layouts of basic mechanical systems employed in commercial buildings.							F/S			
10. Recognize and understand architectural style and historical heritage.				F						
11. Develop site plan layouts.	F		F/S							
12. Think critically.			F				F		F	F
13. Solve problems.	F	F	F	F	F	F	F		F	F
14. Communicate effectively.									F	
15. Demonstrate interpersonal skills.			F							
16. Recognize the value of human diversity.										
17. Demonstrate life management skills.										

F=FORMATIVE ASSESSMENT S=SUMMATIVE ASSESSMENT

Architecture Technology
Landscape Major
Methods of Formative and Summative Assessment
Page 1 of 2

NOTE: The following student outcomes reflect changes made after the assessment process and advisory meeting. Outcomes have been adjusted to reflect this work.

Student Outcome	Methods of Formative Assessment	Methods of Summative Assessment
1. Assist in the preparation of contract/design documents and construction specifications.	Lab performance Project submittal Assignments Intern experience Written/practical exams	Lab performance and preparation of working drawings. Written exams and final projects.
2. Assist landscape professionals in managing and implementing the construction process.	Lab performance Tests and quizzes Intern observations	Written exams and final projects Lab performances in design/build
3. Select suitable herbaceous and woody plants and properly install the same.	Intern experience Tests and quizzes on morphology Design lab performance Identification labs	Exam Final lab Major design projects submittal
4. Estimate landscape project costs by utilizing take-off and costing methods.	Intern experience Tests and quizzes Class assignments Assignments in take-off Costing schedules Lab performance in estimating	Exam Major Project of working drawings with estimates
5. Be able to interpret plans and drawings.	Class assignments Lab performance Tests and quizzes Take home assignments Intern experience	Major projects Intern experience Exam in document drawings
6. Assist in the survey and stake out of the job site.	Lab performance Tests and quizzes Intern experience Class assignments	Lab performance Final lab practicum Exams
7. Create manual and/or computer generated drawings of landscape projects.	Land performance In class projects Quizzes and tests	Lab performance Final design working drawings Portfolio
8. Prepare presentation drawings using a variety of graphic techniques.	Lab performance Tests and quizzes Intern experience In class projects	Major projects Exam Portfolio

Architecture Technology
Landscape Major
Methods of Formative and Summative Assessment
Page 2 of 2

Student Outcome	Methods of Formative Assessment	Methods of Summative Assessment
9. Maintain both commercial and residential landscapes.	Lab performance Quizzes and tests In class practicums Intern experience	Lab practicums Exams
10. Design and install irrigation systems.	Lab performance Tests and quizzes Intern experience	Portfolio Exams Lab practicum Final design projects
11. Think critically.	Lab performance Project evaluation Tests	Projects Exams Presentations Labs
12. Solve problems	Lab performance Tests/quizzes Projects Intern	Intern Tests and quizzes Projects Intern Lab
13. Communicate effectively	Group projects	Project presentation
14. Demonstrate interpersonal skills.	Group projects	Sales presentation Lab Project Presentation
15. Recognize the value of human diversity.		
16. Demonstrate life management skill.	Internships	Internships

HEART of OHIO TECH PREP CONSORTIUM
1996

Construction Technologies Model

PART V:
Labor Market Data

TABLE 1

LABOR MARKET PROJECTIONS FOR PROPOSED TECH PREP MODEL CAREER CLUSTERS 1991-2000*

OCCUPATIONAL AREA	ANNUAL RATE OF CHANGE (%)		TOTAL ANNUAL OPENINGS	
	OHIO	SDA 16	OHIO	SDA 16
Multi-Competency Health Technology				
Nurse Aide	2.7	2.6	2609	362
Home Health Aide	4.0	4.7	516	90
All other	2.4	2.6	357	66
Civil Engineering Technology				
Civil Construction Manager	1.5	1.9	128	26
Surveyor	1.0	1.3	38	8
Drafter	1.1	1.5	769	128
Environmental Technology				
Plant/System Operations	0.1	0.5	360	46
Physical/Life Sciences Technician	0.7	1.2	276	44
Construction Management Technology				
Construction Manager	0.8	0.7	119	29
Graphic Communications Technology				
Graphic Designer	2.1	2.1	607	54
Photographer	0.9	1.8	181	31
Technical Communications Technology				
Technical Writer	1.3	2.3	68	11
Editor	1.8	1.8	247	39

*Ohio Bureau of Employment Services, 1991-2000 Labor Market Projections.

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PART VI:
Advisory/Review Committee Members

HEART OF OHIO TECH PREP CONSORTIUM
CONSTRUCTION INDUSTRY REVIEW MEETING AND DINNER
BUSINESS PARTICIPATION ROSTER - JULY 23, 1996

William Baker
BBS Corporation

Daryl Berry
Berry & Miller Constr.

Bob Blackburn
Geo-Graphics

Randee Buckle

Bob Caldwell
Schooley Caldwell Assoc.

Alicia La Chapelle

John Circle
Franklin County Engineer

Daniel Cline, AIA
Cline Daniel & Associates

Ron Cochran
Kokosing Construction Co.

Jerry Dailey
Dodson-Stilson, Inc.

Rick Doesburg
Thornton Environ. Industries

Larry Fink
LSF Associates, Inc.

Joan Gilcrest
URS Consultants

Jack Gordon
South Texas/Lonestar Drywall

Kevin Harrison, AIA
Firestone, Jaros Mullin, Inc.

Terry Hawk

Fred Hower

Phillip Johnson, AIA

William Kammer
URS Corporation

Kevin Keefer
Gudknecht Constr. Co.

Alden McGee
Sticklen Belsheim

Gary Montgomery
McDonald Cassell & Bassett

Dallas Morlan
Dodson-Stilson, Inc.

Joe Neidhardt
Ohio Concrete Pipe Assoc.

Andy Patterson
The Sherman R. Smoot Co.

Sam Pegg
Karlsberger & Associates

Paul Peterson
The Paul Peterson Co.

Dave Pritchard
Burgess & Niple Limited

Mark Ryan
Rim Rock Corporation

Thomas Schnell, AIA
Wandell & Schell Architechs, Inc.

Lewis Smoot, Jr.
Sherman R. Smoot Co

Kathy Spatz

John Vogel
Schmidt Nursery Co.

Jack Zimmerman

Steve Carter
Solar Testing Lab Inc.

HEART OF OHIO TECH PREP CONSORTIUM
CONSTRUCTION INDUSTRY REVIEW MEETING AND DINNER
HIGH SCHOOL/COLLEGE PARTICIPATION ROSTER - JULY 23, 1996

Dick Bickerstaff, Chairperson
Manufacturing Technology
Columbus State Community College

David Busch, Instructor
Construction Management Technology
Columbus State Community College

Karen Dearbaugh
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Ross Dunlap
Associate Superintendent
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Cheri Dunlap, Principal
Lancaster High School

Connie Faddis, Director
Heart of Ohio Tech Prep Consortium

Guy Forsythe, Instructor
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John Furlow, Assistant Dean
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Marie Wilkes, Curriculum Coordinator
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Richard Wirtz, Instructor
Heating & Air Technology
Columbus State Community College

HEART of OHIO TECH PREP CONSORTIUM

1996

Construction Technologies Model

PART VII:
Program Application

TECH PREP PROGRAM APPLICATION

Tech Prep Consortium Heart of Ohio Tech Prep Consortium Date 1996

Proposed Tech Prep Program Construction Technologies

1. Provide labor market information substantiating employment opportunities in your area.

   Program approved per FY 1996 proposal for operating funds. Labor market data included the following excerpt from the Ohio Bureau of Employment Services, 1991-2000 Labor Market Projections:

OCCUPATIONAL AREA	ANNUAL RATE OF CHANGE (%		TOTAL ANNUAL OPENINGS	
	OHIO	SDA 16	OHIO	SDA 16
Civil Engineering Technology				
Civil Construction Manager	1.5	1.9	128	26
Surveyor	1.0	1.3	38	8
Drafter	1.1	1.5	769	128
Construction Management Technology				
Construction Manager	0.8	0.7	119	29

2. List the potential associate degree/apprenticeship exit occupations for this Tech Prep program.

   See attachment, list of College Exit Occupations.

3. List the potential high school exit occupations for this Tech Prep program.

See attached list for High School Exit Occupations.

4. Describe your consortium's plan for delivery of this Tech Prep program.

Pickerington High School began delivery of this program as a district-based vocationally funded unit at grade 11 in school year 1996-97, with the approval of the Eastland VEPD. Pickerington has chosen to give the model a Civil Engineering Technology slant, which means that all secondary competencies will be delivered but applications will tend to focus on civil engineering technology problems.

Eastland VEPD plans to open a satellite program at Gahanna Lincoln High School at grade 11 in school year 1996-97, also as a vocationally funded unit. This site will slant the model's applications toward architecture and construction technologies. The program will be open to students from any of Eastland's 16 associate districts.

At this time, Columbus State Community College is the only postsecondary partner planning to offer Tech Prep college pathways to complete this model. Students completing the high school portion of the program have 5 Tech Prep college pathways from which to choose. The college will enable the Tech Prep high school to receive college credit for competency areas they have mastered; students will be strongly encouraged to complete the entire Tech Prep college pathway of their choice, which includes advanced skills coursework.

The Consortium has distributed copies of the Construction Technologies program model to all partner schools and colleges. Schools that currently do not offer the model have been encouraged to consider doing so. The model will be reviewed annual at the local level, and every three years by the Consortium's Construction Technologies Program Advisory Committee.

High School Exit Occupations:

Entry-Level CAD Drafter, Construction Laborer, Survey Crew Rod-person, Entry-Level Materials Technician, Construction Clerk, Entry-Level HAC Estimator, Entry-Level HAC Indoor Air Quality Technician

College Exit Occupations:	**TECHNOLOGY**				
	Architecture	**Civil Engineering**	**Construction Management**	**Heating and Air Conditioning**	**Landscape**
Exit Occupation/Position					
Construction Quality Control Technician		Yes	Yes		
Computer Aided Design/Drafter	Yes	Yes		Yes	Yes
Materials Technician	Yes	Yes	Yes		
Construction Field Engineer		Yes	Yes		
Assistant Construction Superintendent		Yes	Yes		
Assistant Construction Project Manager			Yes		
Surveying Technician/Construction Layout		Yes	Yes		
Construction Estimator		Yes	Yes		
Construction Scheduler			Yes		
Certified HVAC Service Technician				Yes	
HVAC Equipment/Ductwork Installation Technician				Yes	
Materials & Equipment Marketing and Sales			Yes	Yes	Yes
HVAC Control Specialist				Yes	

College Exit Occupations:	**TECHNOLOGY**				
	Architecture	**Civil Engineering**	**Construction Management**	**Heating and Air Conditioning**	**Landscape**
HVAC Equipment Application Technician			Yes		
Facilities Management Technician	Yes	Yes	Yes	Yes	Yes
HVAC Indoor Air Quality Technician				Yes	
Energy Management Technician				Yes	
Landscape Designer					Yes
Landscape Foreman					Yes
Wholesale/Retail Nursery Manager					Yes
Botanic Garden Manager					Yes
Arboriculture Crew Member					Yes
Irrigation Specialist					Yes
Estate Grounds Manager					Yes

Prerequisites for College Portion of Tech Prep:

No specific prerequisites are noted because articulation and/or proficiency testing will determine at what level the student will enter into the program. However, in order to follow the advanced-skills sequence as closely as possible, student should place into MATH 148 College Algebra. Students will be required to participate in college placement tests to determine mathematics and communication skill levels. Provision is made for students placing in higher level mathematics or communication skills.

Suggested Electives:

In addition to the Mathematics requirement, the student should have a unit of high school applied or technical physics. The specific area of physics should be in mechanics; i.e. vector analysis and resolution of forces. Occupation building electives should include exposure to carpentry or rough framing residential type structures (Heating and Air Conditioning Technology and Landscape Program excepted).